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Journal of the Society of Arts.

FRIDAY, JANUARY 31, 1868.

Announcements by the Council.

ARTISANS' REPORTS ON THE PARIS EXHIBITION.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

ORDINARY MEETINGS.

Wednesday evenings, at Eight o'clock:—

FEBRUARY 5.—“On the Extension of the Commercial Relations between the United Kingdom and India, by means of Collections of Manufactures and Products, arranged and distributed so as specially to facilitate the Operations of Trade.” By J. FORBES WATSON, Esq., M.D., Reporter on the Products of India to the Secretary of State for India in Council. On this evening SAMPSON LLOYD, Esq., Chairman of the Associated Chambers of Commerce, will preside.

FEBRUARY 12.—“On the Supply of Animal Food to Britain, and the Means Proposed for Increasing it.” By WENTWORTH LASCELLES SCOTT, Esq., F.C.S.

FEBRUARY 19.—“Report on the Art-Workmanship Competition, 1868.”

CANTOR LECTURES.

A course of lectures “On Food,” is now being delivered by Dr. Letheby, M.A., Professor of Chemistry in the College of the London Hospital, and Medical Officer of Health, and Food Analyst for the City of London, as follows:—

MONDAY, FEBRUARY 3RD.—LECTURE III.
Preservation, Preparation, and Culinary Treatment of Foods.

MONDAY, FEBRUARY 10.—LECTURE IV.
Adulterations of Food.—Conclusion.

The lectures commence each evening at Eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose have been forwarded to each member.

INSTITUTIONS.

The following Institution has been received into Union since the last announcement:—
North Cheshire Chamber of Agriculture (Macclesfield).

SUBSCRIPTIONS.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed “Coutts and Co.,” and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

MUSICAL EDUCATION COMMITTEE.

The Committee on Musical Education has been appointed, consisting of:—

H.R.H. the Prince of Wales, K.G., *Chairman*.

Lord Henry Gordon
Lennox, M.P.
Lord Gerald Fitzgerald.
Sir John P. Boileau, Bart.
Sir John Harington, Bart.
Sir Francis Sandford.
R. K. Bowley.
Edgar A. Bowring, C.B.
Harry Chester.

Henry Cole, C.B.
Capt. Donnelly, R.E.
Herbert Fisher.
William Hawes, *Chairman of the Council*.
R. F. Puttick.
Samuel Redgrave.
Colonel Scott, R.E.

With power to arrange for a deputation to confer with Her Majesty's Government.

Proceedings of the Society.

CONFERENCE ON TECHNICAL EDUCATION.

The Conference met in the Society's Great Room on Thursday morning, the 23rd January, at 12 o'clock. WILLIAM HAWES, Esq., F.G.S., Chairman of the Council, in the chair.

The following is a list of the principal persons present:— The Earl Granville; the Earl Russell; the Earl of Lichfield; Sir C. Wentworth Dilke, Bart., M.P.; Sir J. D. H. Elphinstone, Bart.; Sir J. P. Kay-Shuttleworth, Bart.; Sir Walter Stirling, Bart.; Sir Walter C. Trevelyan, Bart.; the Right Hon. H. Austin Bruce, M.P.; Right Hon. W. Cowper, M.P.; the Right Hon. G. J. Goschen, M.P.; the Right Hon. C. Pelham Villiers, M.P.; the Hon. Auberon Herbert; Mr. T. D. Acland, M.P.; Mr. A. S. Ayrton, M.P.; Mr. Thomas Bazley, M.P.; Mr. Charles Buxton, M.P.; Mr. George Dixon, M.P.; Mr. B. Samuelson, M.P.; Mr. J. Stansfeld, M.P.; Dr. Lyon Playfair, C.B. (Edinburgh University); Mr. Edgar A. Bowring, C.B. (Secretary of the Royal Commission for the Exhibition of 1851); Mr. Henry Cole, C.B. (Secretary of the Science and Art Department); Mr. Samuel Andrews; Mr. Antonio Brady; Mr. Harry Chester; Mr. Samuel Redgrave; Mr. Seymour Teulon; Mr. G. Fergusson Wilson, F.R.S.; Mr. Philip Wright; Judge Manockjee Cursetjee; Rear Admiral E. Halsted; Rear-Admiral E. Ommanney, C.B.; Rear-Admiral A. P. Ryder; Major-General C. Dickson; Lieut.-Col. F. Miller, R.A. (Royal Artillery Institution, Woolwich); Lieut.-Col. A. Strange; Captain Beaumont, R.E. (Paris Juror); Captain Donnelly, R.E. (South Kensington Museum); Captain Gardner; the Provost of Dundee (William Hay); the Mayor of Kendal; Mayor of Macclesfield (David Clarke); Mayor of Sunderland (E. T. Gourley); Mayor of Wakefield (W. H. Lee); Alderman and Sheriff D. H. Stone; Alderman David Salomons, M.P.; Alderman Rhodes (Wakefield Chamber of Commerce); Messrs. Edward Webb

(Worcester Chamber of Commerce), H. W. Binns (Worcester Chamber of Commerce), Henry Brocklehurst (Macclesfield Chamber of Commerce), Thomas Browning (Manchester Chamber of Commerce), Alfred Field (Birmingham Chamber of Commerce), Wright Mellor (Huddersfield Chamber of Commerce), John Rotherham (Coventry Chamber of Commerce), Prof. Adams (King's College, London), Prof. Anderson (University of Glasgow), Dr. F. Crace Calvert, F.R.S. (Royal Institution, Manchester), Prof. Goldstücker (University College, London), Prof. T. W. Goodeve (King's College, London, and Examiner for the Society of Arts), Prof. J. G. Greenwood (Owen's College, Manchester), Prof. William Hughes, F.R.G.S. (King's College, London, and Examiner for the Society of Arts), Prof. Huxley, F.R.S. (Royal School of Mines), Prof. Robert Kerr (King's College, London), Prof. Leone Levi (King's College, London), Prof. Hayter Lewis (University College, London), Prof. G. D. Liveing (Cambridge University), Prof. Fleeming Jenkin, F.R.S. (University College, London), Prof. Rymer Jones, F.R.S. (King's College, London), Rev. Prof. H. Pestonji (King's College, London), Rev. Prof. Plumtre (King's College, London), Prof. W. J. Macquorn Rankine (Glasgow University), Prof. Thorold Rogers (Oxford University), Prof. Tennant (King's College, London), Prof. John Wilson (Edinburgh University); Revs. Edwin A. Abbott, M.A. (City Middle School), Jonathan Bates (Colchester Grammar School, and Examiner for the Society of Arts), Hon. Samuel Best (Southern Counties Adult Education Society), W. H. Brookfield, (South Kensington Museum, one of H.M. Inspectors of Schools), Dr. Carver (Master of Dulwich College), S. Cheetham (King's College, London), B. Morgan Cowie (Professor of Geometry, Gresham College, one of H.M. Inspectors of Schools, and Examiner to the Society of Arts), John G. Cromwell (St. Mark's College, Chelsea), Alexander J. D. D'Orsey (King's College, London), J. G. C. Fussell (one of H.M. Inspectors of Schools), W. H. Grey, M.A. (Watt Institute and School of Arts, Edinburgh), Dr. Irons (Vicar of Brompton), H. Jona (King's College, London), W. Jowitt (City Middle Schools), G. P. Keogh, M.A., W. C. Lake (School Commissioner), Canon Melville, Muirhead Mitchell (one of H.M. Inspectors of Schools), R. W. Morris (Hoddesdon Institution), Canon Norris, John Oakley (Diocesan Board of Education), Bartholomew Price (Oxford University, and Examiner for the Society of Arts), James Ridgway (Culham College, Oxon), Arthur Rigg (The College, Chester), T. Teignmouth Shore, M.A., F.R.G.S., Henry Solly (Working Men's Club and Institute Union), J. Woolley, LL.D. (Director of the Royal School of Naval Architecture, and Examiner for the Society of Arts); Drs. A. J. Bernays (St. Thomas's Hospital), Francis Bond (Hartley Institution, Southampton), E. Christian (Ipswich Working Men's College), James Ellis, Clement Le Neve Foster (Miners' Assoc., Cornwall, Paris Juror), Michael Foster (University College, London, Examiner for the Society of Arts), George Harley (University College), Charles J. Hare (University College), M. Forster Heddle (St. Andrew's University, Scotland), M. Henderson, Robert Hogg (Examiner for the Society of Arts), Stevenson Macadam (Royal Scottish Society of Arts), Robert J. Mann (Superintendent of Education, Natal), Alfred D. Sharman, Frederick R. Smith, R. Angus Smith (Manchester), Thomas Stevenson (Guy's Hospital), J. Storrar (School Commissioner), J. Yeats (Middle School, Peckham); Messrs. W. C. Aitken (Birmingham and Midland Institute), J. P. Baker (Inspector of Mines), John Banks (Hastings Mechanics' Institution), G. C. T. Bartley (South Kensington Museum), H. A. Bowler (South Kensington Museum), J. Bryce (Oriental College, Oxford), James Caird (Inclosure Commissioner), G. W. Clarke (N. Cheshire Chamber of Agriculture), Alexander Craig (Glasgow Institution), E. A. Davidson (City Middle School), P. De la Motte (King's College, London), George Griffith (Secretary, British Association for the Advancement of Science), J. W. Hales (Christ College, Cambridge), Thomas Hall, B.A. (City of London School), T. E. Heller (Lambeth Educational Board), James Hole (Associated Chambers of Commerce, London), John Howard (Islington Public School), J. F. Iselin, M.A. (Department of Science and Art), F. E. Kitchener (Rugby Evening Classes for Young Women), H. Latham (Oxford), Ben Lockwood (Huddersfield), William Marriott (Huddersfield Mechanics' Institution), G. N. Menzies (Highland and Agricultural Society of Scotland), C. W. Merrifield, F.R.S. (Royal School of Naval Architecture), H. Meyer (Hanover), J. Slaney Pakington (Worcestershire Educational Union), Thos. Paterson (Working Men's Club and Institute Union), J. H. Pollen (Science and Art Department), Hodgson Pratt (Working Men's Club and Institute Union), Richard Redgrave, R.A. (Paris Juror), George Robertson (President of the Royal Scottish Society of Arts), J. C. Robinson (Science and Art Department, Paris Juror), John Robinson (Owen's College, Manchester), W. Rossiter (South London Working Men's College), Charles S. Roundell (Merton College, Oxford), J. Russell (Trinity College, Cambridge), H. H. Sales (West Riding Educational Board), R. F. Sketchley (South Kensington Museum), R. P. Spiers (Architectural Association, London), F. Talbot (South Staffordshire Educational Association), George Wallis (Science and Art Department,

(Paris Juror) James Young (of Bathgate, Leeds), W. H. Ablett, Kenneth Austin, Charles M. Barker, T. Horlock Bastard, John Bennett, Samuel R. Bennett, T. T. Bernard, William Botly, William Brookes, Hyde Clarke, H. B. Clifton, Lloyd Clowes (Paris Juror), R. Coningsby, Thomas Connolly, W. Corbett, Thomas Danby, F. A. Day, W. J. Day, T. Despointes, Charles Wentworth Dilke, J. Passmore Edwards, George Foggo, John Fretwell, jun., W. Gilbertson, James Glaisher, F.R.S., George Godwin, F.R.S., Henry Gore, Edward Hall, F.S.A., J. Hamer, Charles Hart, T. H. Hartley, B. Waterhouse Hawkins, Alexander Haylin, Julian Hill, Paul R. Hodge, C.E., G. N. Hooper (Paris Juror), W. H. James, John Jenkins, M.A., Edmund Johnson, John Jones, H. L. Keeling, G. J. Knight, J. G. Liddiard, Benjamin Lucraft, James Macdonell, Robert Mallet, C.E. (Paris Juror), W. D. Michell, Thomas Muir, F. A. Myers, W. Newmarch, F.R.S., A. Nicholls, Ernest Noel (Paris Juror), W. O'Brien, C.E., B. H. Paul, J. Payne, Thomas Peard, J. Arthur Phillips (Examiner for the Society), William Pitman, H. D. Plimsoll, Wyndham S. Portal (Paris Juror), C. S. Ratcliff, J. Rebmann, F. W. Rogers, J. Scott Russell, F.R.S., (Paris Juror), Trelawny Saunders, C. L. Shadwell, Edward Spender, Henry Staines, Robert Stothard, J. Sutherland, O. J. Thicke, H. O. Thompson, W. Cawthorne Unwin, Cornelius Varley, Henry Vaughan, Henry Ward, J. B. Ward, J. Webber, Charles White, Henry Whitfeld, Charles Woollo-ton (Paris Juror), G. T. Wright, and Thomas Wright.

The Duke of Marlborough (Lord President of the Council) forwarded, for the use of the Conference, proof copies of a translation of the Report of a Commission appointed by the French Government to inquire into the question of Technical Education.

The CHAIRMAN—My Lords and Gentlemen—I feel that some apology is due from me for taking the chair on an occasion of this kind, in the presence of so many who are much better able, both from their position and the information they possess upon this subject, to fill that office. Still, as Chairman of the Council of the Society that has thought it right to summon this Conference, it becomes my duty to preside over it. I will not detain you by any statement of my own opinions, but will now merely introduce the subject for this day's discussion by reading the programme which the Society has issued, and giving you a general idea of the resolutions it is intended should be proposed. The programme to be submitted to your consideration is as follows:—

The Council propose the following programme of the topics for discussion at the meeting. As the Council have reason to expect that the Conference will be numerously attended, and it is only to sit for two days, it is thought desirable that it should deal rather with general principles than with details, and that the latter should be taken up more deliberately by the committee which it is proposed should be established:—

1. The necessity for improved national education for the working classes generally.

(a.) Improved primary education, and the measures necessary for securing the same.

(b.) Additional facilities in primary schools for affording the elder children the means of learning the elements of scientific knowledge.

2. The necessity for the establishment of schools for technical and industrial education in relation to science and art, in which pupils after leaving the primary schools may obtain instruction suited to the special industries with which they may be connected, as workmen, foremen, or managers.

3. The best measures for securing the foregoing object.

4. How far technical education can be promoted by the aid of existing educational endowments.

5. To request the Council to appoint a standing committee of members of the Society of Arts and others, to take whatever steps may be required to advance the objects approved by the Conference, and to send deputations to the Government, to support such applications as may seem desirable.

I will now read to you the resolutions which it is proposed to submit to you:—

1. That to establish and maintain a system of technical education adequate to the requirements of Arts, Manufactures, and Commerce in the United Kingdom, the three following educational reforms should be effected:—1st. In the universities, grammar schools, and other educational institutions for the upper and middle classes of society, instruction in science and art should be placed on the same favourable footing as other studies; 2nd. Efficient means of primary and secondary instruction should be brought within the reach of the working classes everywhere, and encouragement should be given to the study of the elements of science and art in the upper classes of all primary schools which receive aid from Government; and 3rd. Special institutions for technical instruction, adapted to the wants of the various classes of society, and to the industries of the country should be established and maintained in the United Kingdom.

2. That in such measures as may be desirable for the general provision of the means of efficient primary and secondary education, it would be right to consolidate and improve, rather than overthrow, what has already been done, but that the voluntary principle requires to be supplemented by local rates for education.

3. That while this Conference acknowledges the benefits which have ensued from the educational clauses of the Factory Acts, it is of opinion that the Legislature ought now to provide that all children between certain ages, employed in remunerative labour of a certain character, should receive education during at least a minimum number of hours in each year, security being taken that the education be conducted in efficient schools.

4. That the Council of this Society be requested to appoint a standing committee to take such steps as may give effect to the foregoing resolutions, to support all such well-advised schemes for technical education as may be brought before it, to send such deputations to the Government as may seem expedient, and to re-assemble this Conference when desirable.

The first resolution will be proposed by Dr. Lyon Playfair, and will be seconded by Earl Russell.

Dr. LYON PLAYFAIR, C.B., F.R.S.—Since I entered, I have been very unexpectedly called upon to move the first resolution, which brings forward the general principles upon which the Conference will be asked to give an opinion. The first part of this general resolution asks us to affirm that the universities, grammar schools, and other public educational institutions of the country, should accept as part of their scheme instruction in science and art upon as favourable terms as they accept other schemes of instruction, which at present do not include these. Perhaps all of us are familiar with the report of the Public Schools Commission. That report tells us that only one-third of all the boys of the great public schools go to our Universities—that therefore two-thirds pass directly from the schools to enter into the various pursuits of life—and therefore it is clear that if the school becomes the only university for such a large proportion as two-thirds, and for a much greater proportion in proprietary schools, the education given in these schools should be of a character to fit them for the life that they are about to enter. Now, in this country, we know that is not the case. None of us here, I am sure, would wish to depreciate any branch of learning; none of us would wish to see intellectual culture reduced; but all of us would desire to see the public schools of the country made much more catholic in their character, and more fitted for the purposes of life. There are two systems, we may say, of education. One is the natural system, which prepares a man for his future pursuits in life; the other is an artificial system, which trains his mind by processes of education which are not adapted to, and which are rarely used in, his future life, but which are supposed to strengthen the intellectual faculties. I will say nothing whatever in depreciation of classical education. I believe that classical education is an excellent training of the mind in certain directions, but not in all; and I think all now admit that science has reached so high a

stage that it may be used as a means of high mental cultivation, while at the same time it gives a class of knowledge which may be made practically useful in every walk of life, and so may be wisely introduced into the great schools of the country. That is what we are asked to affirm. But we are asked also to affirm that it is to be admitted on equal terms with other branches of knowledge. At the present moment some schools have made great steps in admitting science on about equal terms with dancing, that is to say, they give one or two hours a week to it. Or they may even admit it on equal terms with French, which is very rarely the case, but it is generally made entirely subordinate, and where classics are made the subjects of high honours and scholarships or exhibitions in the schools, science receives no distinctions. The universities are ports into which the ships come from the schools, and the ports must be adapted to the character of the ships which they are to receive. Now, if our scholars go up from our public schools without any scientific knowledge, or any knowledge of art, the universities must suit themselves to the scholars who are sent up to them; and we know now that there is no encouragement, or very little, given in our universities to scientific education; in Oxford, notwithstanding the new improvements, they have only twelve professors of science as compared, if I recollect the number rightly, with 42 professors in Berlin. I contend, further, that experience shows that our great universities are not adapted to the wants of the time, because one-third (I speak from the Oxford reports themselves) of all the 1,700 students attending the Oxford University have to be paid in money for their attendance; that is to say, have to receive scholarships, of the average of £80 a year, to induce them to go to the education which they do not find fitted for the ordinary pursuits of life. In the other universities, such as the poor Scotch universities, the University of Edinburgh, for instance, where there are scarcely any endowments, we have 1,500 students compared with the 1,700 in Oxford; but we receive them because the education is of a more large and catholic character, and more suited to the wants of the age; because these institutions are woven into the national life of the country. Students come to us without large inducements. We therefore request that all these assistances—the mighty assistances of fellowships and scholarships in Universities—should be given for all branches of knowledge equally. By all means let them be given for high classics and mathematics, and for all kinds of culture; but let them not be confined to one kind of culture alone. Let us ask that those subjects, which are so essential to the progress of industry, and the progress of the kingdom, should be put on the same footing. There never was a time when those of us who wish to see education greatly enlarged in its character had greater hopes than now. Take, for instance, that admirable volume of “*Essays on a Liberal Education*,” recently published—written by the masters of our great public schools—and we see how much the schools are endeavouring to reform themselves from within. Let us give them all encouragement, and show them that we appreciate their efforts. We do not want to see one atom of their culture lessened, but we believe that by introducing scientific subjects we shall fit men better for their after-pursuits, and that their faculties will be improved. At Rugby, they have recently introduced science into education. Not one master in Rugby would now wish, I believe, to go back to the old system; for they find that in enlarging the scheme of education, the standard of knowledge is rather raised than limited. Let us look at Cheltenham, an admirable example, which gives a general basis of education, and then bifurcates into two divisions, one a division giving scientific culture, the other a division giving high classical culture, the demand being nearly equal, because both divisions are nearly equally handicapped, the former by the Royal Military Academy at Woolwich, the latter by the Universities. Let us, therefore, go to the schools and say, we acknowledge their

past efforts, and do not wish to depreciate their culture, but let science be placed on equal terms with other branches of education. The next point we are asked to affirm is a very important one—that “efficient means of primary instruction should be brought within the reach of the working classes everywhere, and that encouragement should be given to the study of the elements of science and art in the upper classes of all primary schools which receive aid from Government.” This is so much connected with resolutions that follow, that a single word on it will be sufficient. I will simply draw attention to the latter part of it. We are about to establish technical schools. These technical schools will not be fed unless we spread a taste for science and art. We have got some of them at present. There is an admirable technical school in Jermyn-street, the School of Mines, but the number of its matriculated students is very small; not from any want of efficiency in the conductors—the professors are of the highest position, and its education is excellent; but the large field of mining industry cannot supply twenty men (I think I am above the mark) capable of receiving the systematic instruction which is there given. We want, before we found these technical schools, to create the taste, and then our technical schools will be well filled. Let us once introduce the elements of science and art into the primary schools of the Government, and we shall soon change altogether the character of the secondary education of working men. The last part of the general resolution is that special institutions for technical instruction should be established and maintained in connection with the various industries of the United Kingdom—special institutions adapted to the wants of the various classes of society, and to the industries of the country. There is already a large movement going on for developing the institutions which we already possess, and no doubt many of them will soon be much better adapted for the promotion of technical education. I hold in my hand a letter which I received this morning from the Treasury, stating that the Treasury has agreed to recommend Parliament to give a vote of £200 a year to meet £200 given by a private individual, for the establishment of a professorship of engineering in the University of Edinburgh. This is a very important movement. I hope that soon we will have a professorship of engineering, through the enlightened intelligence of the manufacturers of Manchester, connected with Owen’s College; just as Sir David Baxter has offered £5,000 to Edinburgh to found such a professorship if the government meet it with a vote of £200 a year, which, as I have said, they are willing to recommend to Parliament. We shall soon see, then, our institutions having these practical professorships; and all this is very gratifying, but it does not meet some of the important wants. We want special technical institutions, fitted for different kinds of industry in our great industrial centres; not fitted for one class of our community alone, but for all classes—one kind of schools adapted for workmen, another kind of schools suited for foremen and managers and sons of manufacturers. Unless all these different kinds of schools, suited to various classes and to various industries, are established, we shall not have reached what is the want of the country. Let us recollect what is the case with regard to France. Without speaking of subordinate schools, there are four *Ecoles des Arts-et-Metiers* at Paris, Aix, Angers, and Chalons, from which every year four hundred men, with the highest education as engineers and chemists, are poured into the industries of France, one hundred from each school; they are trained in the most admirable way, in the highest applied science—trained also to use tools and to work in workshops; and we cannot be surprised that under such circumstances French industry is advancing in the way we have recently observed. We want a certain number of these schools in our great industrial centres; one in Cornwall, one in Manchester, one in Leeds, one in Glasgow, and in various other places.

We want schools corresponding to these great schools of France, adapted to the industries of each particular district. We therefore ask for a general expression of opinion in favour of this resolution. I beg to conclude by moving the first resolution.

EARL RUSSELL said—I rise to second the resolution that has been proposed by Dr. Lyon Playfair, and I am happy to second him because I felt sure—an expectation that has been fully justified—that he was so competent to the whole subject that he would be able to open the discussion in a manner that would carry conviction to the meeting. We are happily in a situation somewhat more encouraging than we have been in for many years in reference to this question, and, to use a phrase employed by Mr. Cobbett, “the straw moves.” It is not, perhaps, very complimentary to our universities and grammar schools to compare them to a rat hunt, still, the illustration is an apt one. With regard to the first part of the resolution, referring to our universities and great schools, I am happy to learn that the Harrow school, one of our great educational institutions, has left off the habit of insisting upon all the boys writing longs and shorts in Latin verse, and has introduced the teaching of physical science. I am sorry to say they have not yet made those lessons in physical science part of the regular curriculum of the school. There is no necessity for boys to learn it, although they may get prizes for it. Still, it is a beginning, and we may hope that they will proceed to further endeavours in that direction. We must, however, be cautious in matters of this nature. I remember learning a lesson of caution in looking over the private library of the Grand Duke at Florence, where I was shown an essay that was written originally by Copernicus, and which had been revised and translated by Galileo, but Galileo, though he was afterwards tortured and imprisoned for venturing to speak the truth regarding the motion of the earth, yet was then excessively cautious and was very much afraid that the very plain way in which Copernicus had stated his doctrine—that, in fact, it was the earth that was moving—might offend the very strong asserters of the contrary view, and he erased many passages in the printed volume of Copernicus, in order that he might not offend people too much by stating to them the truth, which they were hardly able to bear—a truth in physical science that we now take as a mere commonplace. So, likewise, in our great schools and universities, we must proceed very cautiously in proposing the introduction of these new subjects of education. I am happy to say, however, that not only in a public school, but in the University of Oxford, they are making exertions in this direction. There are now some of the most eminent men in the country who are professors of science in that University, and although it is true that there is a very sufficient staff but hardly any soldiers, yet it is to be hoped that the University will before long—especially if Parliament should give some impetus—adopt some system of teaching physical science, and also throw open to those who earn distinction in those studies some of the rewards at its disposal. The fact now is that although these sciences are taught, and there are men like Sir Benjamin Brodie to teach chemistry, and there has been lately appointed a very able man (as I have been told), Mr. Clifton, to teach experimental science, yet the young men who study these subjects gain no rewards from the university, these being all given for classical or mathematical knowledge. I have been told that at an institution in Liverpool, where some are chosen as being of very quick intelligence, and sent to the University of Oxford, immediately they are destined to that university their studies are turned away from all matters of physical science, of commerce, and of manufacture, and they are obliged to attend solely to classics as the only mode by which they can obtain university rewards. You will permit me to say, perhaps, although it is not in this resolution, that I look to the Universities of Oxford and Cambridge as being hereafter really national institutions of which the country

may be proud, and where persons may receive the education that befits the most instructed and the most enlightened citizens of our free and glorious country. For that purpose I should say that men ought to be instructed in the history and the laws of their own country. It is well, indeed, that they should be acquainted with the history of Thucydides and Xenophon, of Livy and Tacitus, but also with the works of Clarendon and Hume, Hallam and Macaulay; that they ought to know something of what has been the history of their own country; what their ancestors have done for the freedom and greatness of the country; and not be contented with the laurels which were gained by Pericles or by Cæsar. I remember, and those who belong to the Social Science Association will probably recollect, a very powerful address of Lord Brougham, in which was a confutation of that line of Pope—“A little learning is a dangerous thing.” Lord Brougham showed how much better it was, as he expressed it, to have half a loaf than no bread; that a little learning was very much better than no learning at all, that some knowledge was better than ignorance, and that every one ought at least to endeavour to attain some knowledge. Now, there will always be many at our public schools and universities likely to inherit large fortunes and to enjoy a life of ease and competence, and who are not likely to study very hard, but at all events it is desirable they should have some competent knowledge on various subjects, not only classics, but physical science, and the laws and history of their country, so that they may be useful members of society, although they may not be profound in any branch of learning, or in any department of science. I come next to the question (a very great question, upon which you will by-and-bye, as I trust, hear Mr. Bruce and others), that efficient means of primary instruction should be brought within the reach of the working classes everywhere. Now, I felt it to be my duty some time ago to open this subject in the House of Lords; and without proposing any plan, for I steadily and resolutely determined that I would propose no plan, because definite plans must be suggested at such meetings as this, and afterwards matured in the House of Commons, I proposed certain resolutions, and I had written as one of them that every child has a right to education. An early friend of mine, a member of the House of Lords, pointed out that it was not a fit resolution to be proposed to a branch of the legislature, because for every right that is isolated there ought to be a remedy, and every right should be enforced, and no child at present has the means of enforcing his right to education; but I put in an epithet, “moral,” that every child has a “moral right,” and then all my friends agreed to the resolution. This seems to me to be an unanswerable proposition. I believe that every child has a moral right to education, and that you are doing a positive wrong to a child, who is to be a member of this great community, when you say, “You shall know nothing of the common arts of reading and writing; you shall have no instruction in morals or in religion; you shall be brought up utterly without any knowledge that there is a God and a Christ, and that there are branches of secular learning that shall be of use to you in after life; and you must be like the beasts of the field, brought up without any knowledge whatever.” I say this is such an injustice to the children of the country, that it ought not to exist any longer; therefore I am delighted to find that my friend, whom I see is present, Mr. Bazley, has been fortunate enough to induce his friends at Manchester to adopt the principle of compulsory education; and I only wish that we could be quite certain that the two Houses of Parliament would be equally liberal. I am quite sure, at all events, that my friend Mr. Bruce will not shrink from the task of bringing forward a measure which, while founded on right principles, shall be, at the same time, such as to have a chance of success; because, as I said, we must not be bolder than Galileo, and we

must endeavour, at the same time, that we establish right principles, to look likewise to success. It was a saying of John Milton's, that this country ought to have the precedence in teaching nations how to live; but this is an object we have not yet attained with regard to education; because, if we look to Prussia and Germany, if we look to France, or if we look across the Atlantic, to the United States or to Canada, we find in all these countries that education is more attainable by the community generally, by the children of the poor as well as the children of the rich, than it is in this country. I hope, however, that this lagging behind, this following at a very great distance other nations of the world, will be not much longer a cause of humiliation to this country, that we shall be at least the equal of other nations; that we shall study their methods; that everything that is good in them we shall be able to secure, and if there are defects and faults, that we shall be able to avoid them. At the same time I cannot but see that between the questions of voluntary effort, and payment, either by local rates or out of the taxes, of large sums for education, there will be considerable difficulty. There is a system that was established—which I had a part in establishing—of aid by the State for voluntary efforts; and there is a system now proposed, of rates, which is established in other countries. Both of these, I think, ought to be employed; but the dovetailing these two systems—the putting them together, and making them both act, is a matter that requires the highest legislative abilities; and I only trust that my friend Mr. Bruce may be successful in the efforts that he may make in that direction. I am glad, I must say, that I have not to undertake the task myself in the House of Commons. I might some years ago have taken for my motto, what my friend Mr. Motley quotes in the frontispiece of his interesting volume, "*Luctor et emergo*." I have struggled for a long time in the House of Commons, but I have "emerged" from there, and I shall not have to take my part in the buffeting of the waves and the roaring of the winds, which, no doubt, will soon shake the walls of Parliament. We lately, I think very properly, in the two Houses of Parliament, supported the government in a grant for the expedition to Abyssinia; it is an additional tax on the country. I trust it will be a very temporary one, and when it is over I do think we might afford for education some of that treasure that we have been so willing to give for the sake of the Abyssinian captives, not at all failing in our duty with respect to the captives in Abyssinia, but at the same time doing our duty to the captives—the poor children who are confined in the prisons of ignorance in this country. The last part of the resolution is one with which Dr. Lyon Playfair is so peculiarly qualified to deal, that I do not mean to enlarge upon it. I have read with great interest, and at the same time with some pain and shame, the report of Mr. Samuelson upon what has taken place on the Continent, and also what has taken place in some of our manufacturing towns, with regard to some branches of industry, in which we seemed to have a great superiority. I cannot expect that we can do anything better than establish schools for technical and scientific instruction. I think those are wanting; and I believe, with regard to the rest, that the good sense of the people of this country, when they are informed of what has been done in foreign countries, and when they see the foreign work that is brought into competition with the very best work that can be produced in this country, I believe that their good sense will teach them not to ask for such exorbitant wages as may throw impediments in the way of trade, while at the same time their skill will enable them to compete with anything that can be brought from any part of the world. But we do require, above all, education. Education is the great subject of this day. It is a subject on which too many minds cannot be exerted; it is a subject which requires the highest faculties, and at the same time requires the general concurrence of the nation, and I hope that both the highest faculties of the best instructed men and the

general common sense of the nation will be given to this great effort. I second the resolution with much pleasure.

Mr. GEORGE GRIFFITH, of Harrow, wished to correct one statement of the noble lord. He was happy to say that since last Easter natural philosophy had been made part of the regular curriculum at Harrow, and it now had considerable weight in the school examinations.

Mr. DIXON, M.P.—I am happy to be allowed to support the resolution which has been so ably moved and seconded, and in doing so I will address my remarks mainly to what seems to be the duty of Government with reference to technical education in the manufacturing districts. But before doing that I should like to be allowed to congratulate Mr. Bazley and those who share his views throughout the country—a number of persons much larger than is usually supposed, and constantly increasing—upon the words that have fallen from Lord Russell to-day. If I understood his lordship aright, he stated that he would be glad if Parliament saw its way to enact compulsory laws with reference to primary education. These remarks, following others of a similar tendency from Mr. Bruce and Mr. Forster in Manchester, I think mark important steps in our educational progress. With reference to technical education, it must be remembered that the Associated Chambers of Commerce, in their meeting two months ago, and I am happy to say, the Birmingham Chamber of Commerce a few days ago, both passed resolutions in favour of Government being called upon to provide schools for technical education throughout the country, and the point to which I am anxious to direct the attention of this meeting to-day is that it would be extremely advisable that in doing so Government should undertake to initiate or to control the establishment of these schools, and not simply to follow any movement that may be made with that object in the various manufacturing districts of the country. Hitherto it has been the policy of the Government merely to supplement what is done for education, and with reference to technical education this plan is now being adopted. The minutes of Council which have lately been issued indicate a continuance of this policy, that is, that where individuals or bodies of men choose to originate or to maintain schools, there and there only Government will come in to aid them. Now, it does appear to me that it would be wise if Government were to take a larger and a bolder policy, and were to say, "We are quite convinced that these schools are required in all the great centres of industry. There is no difference of opinion amongst educated people upon that point, and therefore we feel that it is our duty to see that these schools shall be established, and we will not wait until that conviction has assumed the form of large subscriptions in the various localities concerned." I believe that it would be far better if we had already passed a law enabling corporations to levy taxes for the general purposes of education, and if that law were already enforced I think the action of Government, with reference to technical education, might then be different; that is, that Government might leave to the various localities the performance of these important duties, and keep in the background until it was evident that the localities did not intend to perform them, or did not perform them properly. But inasmuch as we have not these powers, and as it may be some time before these powers are obtained, I do think it would be wise in the Government to say, "We will undertake to see that these technical schools generally are provided wherever they are wanted." For it must not be forgotten, that although these technical schools are in one respect less important than the schools for primary instruction, yet in another sense they may be considered to be equally important, if not more so, because, upon their existence, and upon their use by the great manufacturing people of this country depend the maintenance and the extension of our national greatness, our prosperity, and that wealth which Government requires to see increased, in order

that the revenue of the country may go on proportionally augmenting. I should like to mention what has been done in Birmingham with reference to this subject. We have an Institution called the "Birmingham and Midland Institute," which was established some ten or twelve years ago, and mainly for this purpose. We have also a Government School of Design. These Institutions have been considered to be very successful and flourishing Institutions, and they have certainly done a great deal of good. They are supported (at any rate the Birmingham and Midland Institute is) by the leading men of the town, and exertions have been made to extend these schools in a way that reflects great credit, I think, upon all those gentlemen. And, further than that, inasmuch as these schools are not able to educate the whole of the people seeking that education in our town, we find that, in a distant part of the town, some two miles or more from the Institute, a private individual has established schools for the working classes, and within a very short period upwards of a hundred men went to this school and took lessons in the evenings in science and art. In addition to that, in another part of the town, there is now a movement on foot for the establishment of an art-school of a superior kind—of a kind more adapted to the wants of the manufacturers than the Central School of Design. Therefore I think it is perfectly clear that in Birmingham, at any rate, there is a strong feeling in favour of the establishment and maintenance of schools of science and art. But what is our position? We find that the whole burden of the maintenance and the extension of these schools is thrown upon a comparatively limited number of persons, and that these persons are those men who take the lead in every other question, and are called upon to give their time and their money on every possible occasion and in every direction. I am sure there is not one of those gentlemen who grudges that his time and his money should be devoted to such purposes, but what those gentlemen do feel, knowing how important the question is, is that they are left unaided, and that their efforts do not secure all that they are seeking to obtain. So that they, of all others, would be glad to find that Government appreciates the efforts they are making, and is determined to second them in an efficient manner. But we know that such places as Birmingham may be considered rather as exceptions. There are many districts,—important manufacturing centres,—where, we are told, there are no such schools, and where those who desire to send either their own sons, or the sons of their better workmen to these schools, and would be glad to pay towards the necessary expenses, are unable to do so, because these schools do not exist. In such cases I think Government must, if they are to do their duty, undertake to see that these schools shall be provided. But what I am particularly anxious should be really understood is this,—that if Government shall continue to follow the system that it has hitherto adopted—the system of waiting until the locality shall have shown that it appreciates these great advantages, and shall then give its aid exactly in proportion to what is done in those localities, Government will, in reality, be abdication that great function for which it exists, and, instead of leading, will be following the people, and we shall continue to suffer so long as this ancient policy is continued. We must not hide from ourselves the fact that, whereas on the one hand, educated gentlemen like those I see before me, and, on the other hand, the great mass of the working men of this country, are right upon this matter, and appreciate the great advantages that are to be derived, not only from education in general, but from technical education in particular, and are willing to do whatever may be necessary, a very large number of persons in the middle classes,—those persons who, at first sight, appear to be most especially interested in it, and who ought to come forward to the front in every voluntary effort that may be made for this object,—do not come forward as we could wish, and therefore that the utmost

we can expect from them is, that they should not oppose us when we attempt to carry out what we think to be right and sound measures. They will not help as they ought to do a voluntary movement, but they will not oppose government action. Let us, then, with the educated people on the one side, and the great mass of the people on the other, impress upon government that the time has arrived when they may take this matter more strongly into their own hands, and say that technical education, as well as all other kinds of education, are wanted throughout the country, that technical education we must have, and that they (the government) must see that in some shape or other it is given.

Professor RANKINE, F.R.S., said—I do not rise to make any remarks on the principles of this resolution, as to which there can be no dispute; it would be idle for me to do so; but only to state one or two facts that have been strongly impressed on my mind by my own experience of twelve years as professor of civil engineering in Glasgow University. That chair has been in existence for 28 years, and was instituted long before my appointment; but having derived information from my predecessor, I have, to a certain extent, the benefit of his experience as well as of my own. The first fact that has been impressed upon me is this, that the languishing state in which technical education has so long remained in this country, notwithstanding some isolated efforts to promote it, was mainly owing to a backward state of public opinion upon the subject. There is a well-known old English prejudice against theory; a misgiving or mistrust about the advantage of connecting science with practice; and I am perfectly convinced that the very bad success which that chair and other establishments of the same kind had at the commencement, was owing to the strong influence of that prejudice. By dint of great effort, and also by the advancing state of public opinion, that prejudice has been gradually dying away and weakened; it is mainly owing to an improved state of public opinion as to the advantage of science applied to practice, that the number of students of engineering at Glasgow in the course of a few years has about trebled. I think, too, we have arrived at this point, that the prejudice as to a supposed discrepancy or inconsistency between theory and practice has ceased to exist as an active principle, a principle that would lead people to actively oppose measures for the improvement of scientific or technical education. I quite agree with the last speaker that, to a certain extent, it still exists in the form of a passive principle of opposition, or rather a principle that gives rise to indifference and sluggishness in the promotion of this great object. It is easy to see, then, that one of the principal things to be done, in order to cure the evil, is to produce an improved state of public opinion; and no doubt such is one of the principal objects of this conference. I agree with the last speaker that it is only necessary for somebody to begin; and I believe that the practical taking of active measures to promote technical education in the manner that has been now proposed, will induce many of the indifferent persons to whom I have referred, to change their indifference into active support.

Mr. GEORGE FOGGO said that, having spent the first eighteen years of this century in Paris, he had some acquaintance with the arrangements for scientific education in France, and he knew that its promoters derived very much of their knowledge from this country. There was in foreign establishments of this kind a material difference between the statements of their directors and the reports of those who inspected them, and he should advise Englishmen, while adopting the merits of those establishments, to avoid their defects.

Mr. B. SAMUELSON, M.P., said—I entirely agree with the last speaker in thinking that we should commit a very great mistake in depreciating what has been done in this country. To my mind, there can be no doubt that in the industrial career of nations England has taken the lead, and I believe also that she is still doing

so; and I think that if we are to found our views as to technical education upon the supposed advance of foreign nations we should somewhat weaken them. My short continental tour, and the limited means which I have had of judging, have convinced me that we still, in all those branches of industry in which we have hitherto taken the lead, stand at the head of all continental nations. But it is equally certain that many of the successes which we have achieved industrially have been achieved at an unnecessary cost—that we have arrived at many conclusions by a system of trial and error at which we might have arrived by more direct means if we (when I say “we,” I speak as a manufacturer—of myself—of my class) had been better instructed, and therefore you find in me a very ardent advocate of technical instruction. Now, the resolution which has been proposed, and in which I entirely concur, is very extensive. It refers, in the first place, to our universities and public schools. I entirely concur in urging upon our universities and public schools the desirableness of their giving encouragement to scientific instruction. I am happy to find that they have already entered upon that career; and I learn by a letter lately received that the scientific classes of Oxford are at the present time attended by more than 150 pupils; and I have no doubt that if greater encouragement in the way of fellowships were given, many young men would choose a scientific career who at present occupy their time with classical studies. I may mention that I have recently learnt at Liverpool that from the collegiate schools, numbering altogether 800 students, not more than five young men are annually sent up to the universities; and I think that a town like Liverpool would send up a much larger proportion of young men to the universities if scientific studies were encouraged there. I do not, however, think we can expect that our universities and schools will ever afford precisely the same encouragement to scientific studies that they do to the classics. Experience shows us that in foreign countries that has not been the case,—that the successful technical schools have not been those engrafted upon pre-existing institutions, but that they have been institutions founded for the express purpose of teaching science; and therefore I have no hesitation in supporting the third paragraph of this resolution, which aims at the establishment of special schools for scientific instruction. I shall not enter into an argument with my friend Mr. Dixon as to whether any, or what, local encouragement should be required to precede the establishment of such schools. My friend has said a great deal in favour of immediate Government action. I believe that a great deal might also be said for the contrary proposition, that the initiative should in all cases be taken by the localities. Where, however, two centres of industry have claims so nearly equal to the establishment of a technical school that it would be difficult to decide between them, then I think the local acknowledgment of the want, and the local readiness to supply it, may be fairly taken as giving the casting vote in favour of one or the other. I think that many such instances will occur to you, and I will instance two only—Leeds and Bradford, with respect to the woollen and worsted trade, and Nottingham and Leicester, with respect to the hosiery trade. I think that wherever the greatest local effort is made, the Government should be the most ready to come forward to assist that effort; and if it be said that this instruction is probably most wanted in the locality which is most backward, I believe that the rivalry between two localities would very soon bring the more backward one to its bearings. I think it may be desirable to consider, before any very great efforts are made on the part of the Government, what is the provision for scientific education already existing in the country. I know no branch of this inquiry to which the Society of Arts may more profitably devote itself than to that of ascertaining what are our present local provisions for that purpose. Now, I have recently visited Manchester, and I was somewhat surprised to find that in a small house, formerly the pro-

perty of Mr. Cobden, are housed some three or four hundred students, of whom, I believe, one-half are receiving as efficient instruction in those branches of science which are taught (for not all are taught) as can possibly be obtained in any continental scientific school—I allude to Owen's College. I was delighted to hear from Dr. Lyon Playfair that a contribution is about to be made by the Government for the endowment of a chair of engineering at Edinburgh. I think that a similar contribution might fairly be made to Owen's College, at Manchester. A very few individuals have subscribed their £1,000 each; in one instance, three partners in a concern had each subscribed £1,000 towards the endowment of a chair of civil engineering at Owen's College; and in order that a first-rate man may be obtained for that chair, one individual has promised £250 a year for five years towards the endowment of that one chair. This is not the place to state what further additions might be profitably made to Owen's College, as a first-class scientific institution. We have before us the programme of the Royal Dublin College of Science, which may fairly serve as a guide to Owen's College and to other similar institutions. But, I think, no one can deny that Manchester would be an admirable centre of instruction, and that the exertions of the men of Manchester deserve to be recognised by the State. Now, it is important that the schools which we are to establish must be suited to the various localities, and must not only be suited to the various localities, but must be suited to the various classes of society whom they are to benefit. I may mention the mining school at Wigan. I believe that that school is now in danger of being closed, owing to the death of a gentleman who was its chief support. But, even if that school were continued, it would have made very little impression on mining industry, and for this reason, that it is simply a night school, and not a school in which those for whom it was chiefly designed, that is to say the overmen or foremen of mines, could receive systematic instruction in science. Evening schools are all very well, but it is not to be expected that a man who has been working underground for six or eight hours in the day, should come up, change his clothes, and work afresh at severe intellectual labour, in order to acquire the education which is necessary to constitute a good mining foreman. We find, on the contrary, that in Westphalia, where coal mining is carried on probably with more success than in any other district on the Continent, a mining school of a very different character is established. What they do there is this—if a man working underground has shown superior aptitude, they take him out of the pit and send him to school for two years; they teach him surveying, the elements of mathematics, the chemistry of the substances with which he has to deal, and they fit him in every respect not only to direct, but also to be an example to the miners out of whose ranks he has been taken. These men form a link between the workmen and the technical engineer, a link which with us is entirely wanting, because our foremen are entirely uninstructed. This is another example of the kind of school which we require, and I believe that if such a school were established it would receive an amount of assistance from the mine owners in the locality which they do not think fit to grant to mere evening instruction. I have said that it is desirable that we should found special institutions, or that we should encourage those which devote themselves especially to technical instruction. Dr. Lyon Playfair, in his admirable speech, alluded to the University of Berlin. But the University of Berlin, although it is a great school, is not the school to which the future manufacturers and directors of works in Germany resort. The schools to which they resort are such schools as those at Carlsruhe, Stuttgart, &c. These are special schools; and I feel convinced that unless we establish special schools of various grades we shall not accomplish all that is wanted. I think that we have advantages

over foreign nations in this respect, that we have means of combining science with practice, which, in many instances, are wanting abroad. That brings me to this point, namely, that we have no occasion in this country to adopt the plan which was originated many years ago abroad—but which I think would not now be adopted abroad if they had to begin *de novo*—namely, that of establishing workshops in the schools. We do not require to do that, but we require to bring the school into contact with the workshop, and to establish schools in different localities, so that young men may have the opportunity of becoming both practically and theoretically acquainted with their future employment.

The Rev. A. J. D. D'ORSEY said the public schools and grammar schools had been so frequently alluded to in the course of the discussion that perhaps the Conference would bear with him—a practical schoolmaster of 20 years' experience—if he talked, not of theories, but of what had been done in a school in Glasgow between the years 1834 and 1854. On his appointment as English master to that school—and an English master in a Scotch grammar school did not mean a ruler of copies and a teacher of A B C, but a man who is supposed to be capable of giving somewhat higher instruction than that—he thought it his duty to make himself acquainted with what was doing in foreign lands; and what Mr. Samuelson had done as a manufacturer he (Mr. D'Orsey) had felt it his duty to do as a schoolmaster. He visited the schools in Germany, and saw that there words did not constitute the sole or chief knowledge of a school. He found that words, ideas, and things were associated, and that whereas an English schoolboy would be very much puzzled indeed to tell the size of a room, a German boy would do it at once; that whereas an English boy, give him a sheet of paper, would feel himself sorely perplexed to draw a plan of England, a German boy would be able to do it without any difficulty. In most schools abroad there were not simply pictures, but there were objects themselves. A boy would know a gallon, a quart, and a pint measure, and what a gallon, a quart, or a pint really was. Coming back from Germany with some of this information, he tried to introduce it into the High School of Glasgow. Of course, being a novelty, it was abused but adopted. One individual had said, "What is this that this man is about with our boys? Here is a man that we pay to teach us the English language, and he is bringing scraps of chemistry, that have nothing to do with the English language." He (Mr. D'Orsey) replied, "It has a great deal to do with the English language; you must know what the thing is—the idea—and the word is to express that idea; and until you know that, you have no proper knowledge of what science really means." Further, he thought it well to have books that would convey this knowledge. The Messrs. Chambers at that time brought out an elementary scientific book, which he found very useful. There must be an alphabet of science; there must be preliminary steps before a further advance could be made. The want of this practical teaching it was that rendered our primary schools so inefficient. It was a rare thing to find anything like a practical use of the black-board and the chalk. He formed, by the assistance of the boys themselves, a little museum, where he introduced some simple chemical apparatus, and he showed them things, partly as an amusement, and partly as laying the foundation of science. Moreover, being in the centre of a vast manufacturing population, he took the boys every Saturday to the workshop, to see there in operation what they had been reading of in the school. Some of the boys were in Parliament, others high in office, and others distinguished engineers. Had the system which he had thus pursued towards these boys hindered them in obtaining knowledge? Certainly not. One of them at the present moment held a fellowship at Oxford; and another who went to Woolwich obtained a sword and a medal. He was in a position to prove that proper instruction in science did not at all

hinder literary progress, but, on the contrary, promoted it. He was no advocate for a diminution of instruction in language, but he held that language was better taught when associated with science; and instead of the masters of our public schools saying, "You interfere with our classical knowledge," he said, with reference to the few who were opposed to his system, "Give it a fair trial, and you will find that no such results as you apprehend will ensue." He could point to the City of London School, and other establishments of a similar kind, where many branches of knowledge were taught, in addition to Latin and Greek. That school, five years ago, had the distinguished honour of one of its scholars taking the distinction of senior classic, and another that of senior wrangler.

The Right Hon. H. A. BRUCE, M.P., said—I have listened with great pleasure to the speaker who has just addressed you with so much good sense and sound wisdom. I think we may assume such general propositions, as the importance of teaching the sciences as a necessary part of education, and may proceed to consider how the necessary means of education can be supplied, and how education, from the highest to the lowest, can be promoted in the most efficient manner. The resolution embraces all these points, and I think the meeting will be of opinion, after what they have heard, that hard work indeed is cut out for those whose duty it is to give practical effect to these resolutions. Not only will there be practical difficulties of all sorts, such as Earl Russell has alluded to, in making the existing system dovetail with the improvements which we hope to introduce, but we shall be met with questions of principle which are not, perhaps, as strongly debated in an assembly like this as they will be in an assembly like the House of Commons. However, I will assume that the national will is already sufficiently decided to carry some really useful educational measure through Parliament. With respect to the universities, there seems to be a growing opinion throughout the country that they should not only modify their studies, but that they should encourage, by admitting to their highest rewards, those who have distinguished themselves in other branches than classics and mathematics; so much I will assume. The next question I look upon as the most important one, and that is, how to improve our middle-class education. Here we have before us the subject divided into two. How shall we provide for our middle classes the means of fitting them for the highest education which the university can give; or, if they are unable to proceed to the university, of fitting them with sufficient education to carry them through life. For the solution of this question I look very much indeed to the forthcoming report upon education from the commission which is now sitting. I think we are hardly in a position fully to discuss this question without knowing the facts which that report will communicate to us, and the recommendations which the gentlemen upon that commission will make. I do not hesitate to say that whilst I agree with Mr. Dixon in looking to government for aid, I do look to the proper use of the great endowments of this country as a means of solving the greatest part of this difficulty. I am not altogether of opinion that government should so far take the initiative as to provide at once the funds and means for founding technical schools in Leeds, Birmingham, and other towns, but I think it would be their part at once to announce that they would be ready to give considerable assistance to any large town that would undertake that task, and thus to assist the extension of institutions like Owen's College, which have already met with great success, further action being limited for want of means. We want good middle-class schools, at which the middle classes can on moderate terms be educated in all those branches of knowledge which we all know to be essential. The question is how are funds to be provided for that purpose. I think that existing endowments furnish the means. I would ask those who object to the

transfer of local endowments to remember how much circumstances have changed since those endowments were originally made. Let us remark a most important change, which may be called the migration of our population. During the last census there has been a diminution of the agricultural population. If we wish to do good to the descendants for whom these endowments were founded in the rural districts, we must follow them into our large towns. I believe that a good use of those endowments would furnish us with very nearly a sufficient number of schools in all our great centres of population; and combining with this the action of Government in founding a few great schools at a few great centres, as model schools, we shall have in a great degree solved the difficulty with regard to middle-class instruction. I then come to the assistance that the State can give to the instruction of the working classes. Now, I fully agree with those who say that, great as have been our voluntary efforts and their success, still that success has only been partial, and we have no reason to believe that it will ever be complete. There are districts so circumstanced that success under the voluntary system really seems impossible. It is high time, therefore, if it has become the national conviction, that some steps should be taken to remedy the evil, and the only way out of it is by enabling every locality to tax itself, and not only so, but ultimately compelling it to do so. Then comes the question, To what purpose should these national funds be applied—merely to educate children in the merest elementary knowledge, or to confer upon them such an increased amount of knowledge as will enable them to avail themselves of the superior instruction which is given in the science classes, and also to avail themselves of those endowments which will enable them to gain scholarships, and advance from the middle-class schools to the universities, and so enable the country to enjoy the benefit of the special talents with which individual children in all classes are frequently endowed? Now, the effect of the revised code on our middle-class schools has been in many respects excellent. It has secured the thorough teaching of what is absolutely necessary to all classes of our children, but it has undoubtedly—it cannot be denied—had the effect of rather reducing the amount of education in the upper branches. I saw with great pleasure, during the last session of Parliament, that Mr. Corry, then Vice-President of the Committee of the Privy Council on Education, said something should be done to remedy that defect. I ventured to express a doubt whether the encouragement which has been hitherto given in this respect was sufficient. There is nothing like practical proof. I am furnished with this practical proof, and, as an example of this sort impresses itself more strongly than any general proposition, I will state what occurred in my own school with respect to this particular subject. It is a very large one, but it is in a colliery district, where the temptations to leave school are very great, inasmuch as large wages can be earned at a very early age. I was anxious that the children should be instructed in grammar, geography, and history, and I therefore directed the master to do his best so to instruct them, and to send up as many pupils as were fitted for examination in those subjects. The Minute of Council prescribed these conditions—that one-fifth of the children in average attendance should be presented, and that three-fourths of those should pass, or no grant should be made. The number of my boys in average attendance was 198, out of a number exceeding 300 on the books. It was my business, therefore, to present 40 children, but, unfortunately, by an accident, only 39 could be presented. Of those 39, 30 passed, and I fell short of the prescribed condition by one, and the Committee, interpreting their rule strictly—I am not at all quarrelling with the justness of their act—refused me any grant. I must say, however, that I was greatly consoled when I found that all I could have earned under that Minute of Council would have been 40s. However well meant such an effort to

encourage superior instruction must be, in a pecuniary sense it is useless. This standard is called the 7th standard, including the examination in geography and history. We must, however, have an eighth standard, which must provide for the subjects of physics and natural philosophy, so as to enable children when they leave school to take advantage of our scientific schools. Now, how is this to be done? It can only be done by keeping children a sufficient time at school. That point has come very strongly upon me. It is no use having an eighth standard if children do not remain at school till their 14th year at least, and when we talk of the number of children attending our schools, we forget the early age at which they come to our schools. I have, at my school, between 30 and 40 children under three years of age. In Prussia, when the educational census is taken, it is of the population at school—at the primary school from 5 to 14. A child emerging from those schools may attend the scientific classes with the certainty of profit. Unless we take some effective steps, either by offering temptations in the shape of rewards, which are not without their effect, or by introducing a system of compulsory attendance at school, up to a certain age, it would be useless to talk of giving the children advanced instruction, and without that our science classes will be useless. I am glad to see, from the Report of the Committee of Council, that there has been, in the last year, an increase in the number attending the science schools, from 6,000 up to 10,000. But what is that? In the similar schools in France, according to Mr. Samuelson's statement, you have 268,000 children attending schools quite as good, if not better, than our schools. The City of Paris alone gives £200,000 every year; and wherever you see any account of the sums raised for education, you find everywhere the local authorities contributing large sums, which in this country are altogether wanting. The local contributions will bring local interest. We shall have a larger number of persons interesting themselves in this question. Education will have a higher value; and it is only when we have it so diffused and locally supported that the mind of the country will be so thoroughly penetrated with the importance of education, that we shall have all our schools filled and raised to that degree of efficiency which we all hope to see them reach. I will add no more at present. I have endeavoured to indicate, although very generally, what I believe to be the main object—the improvement of our middle-class schools. I believe that we only want a strong expression of the public will in a proper manner, to secure to this country the immense advantages of developing the natural power of its people in a manner equal to that which is done on the Continent.

Mr. C. S. ROUNDELL, after approving the resolutions before the conference, which seemed to him to express the true principle of all educational progress, proceeded to say that, as a Fellow of one of the Oxford Colleges, he would endeavour to tell them what the University of Oxford had, within the last few years, done in the interest of natural science. The Universities of the country were not stagnant but moving bodies—bodies which were anxious to do all in their power to promote the highest interests of education. As regards the University of Oxford, the light which now pervaded that place was traceable, in his opinion, to that memorable Commission issued, by Earl Russell fifteen years ago, the work of which was carried out by the Act of 1854, under the auspices of Mr. Gladstone. What had they been enabled to do for natural science under the legislation of 1854? He thought he might say that every College, or almost every College in Oxford, had entered in its ordinances a provision—not a compulsory one, but a direction almost equivalent to an injunction—that in awarding its prizes each college is to have regard, from time to time, to excellence in the various branches of study—not to confine itself to one. He was a Fellow of the oldest College at Oxford (Merton), and he hoped he might be allowed to say that

that College was the first to offer for public competition one of their fellowships for excellence in natural science alone. In his opinion little or nothing would be done for natural science in the Universities until the Colleges awarded something for the encouragement of art and science; not only in the way of fellowships, but also in the offer of scholarships and exhibitions. He hoped they might look for considerable encouragement being given in this way. The resolution affirmed that the study of natural science and art ought to be put on an equal footing with other studies. He thought, however, that at the University their first duty was to do nothing to degrade the University standard. Let him not be misunderstood, he was not now speaking as one wedded to the classical system. He had got beyond that. He was quite ready to adopt those principles which had been expressed, as Dr. Playfair had said, in a late work, "Essays on a Liberal Education," but he thought that our first consideration must be to maintain the standard. Those who wished to see natural science flourish at the Universities should consider most carefully how they could do that consistently with the duty of maintaining the high standard of university education. He believed that there were certain branches of science which were merely mechanical, and did not contain within them the true educational elements. Therefore he said, above all things, they must be careful, however liberal they were, that they did nothing to degrade the university standard.

Earl GRANVILLE said—I feel that there is a great practical object in this meeting. I think the twofold object is on the one hand to express what public opinion is on this great subject of education, and on the other hand to stimulate that public opinion. Lord Russell, in delivering his speech (and I am sure, notwithstanding his long and laborious life, and all his great political achievements, one of the most satisfactory reminiscences he can have is looking back at his consistent labour in the cause of education) stated, and, I thought, with sound judgment, that he preferred leaving it to Dr. Playfair, who is practically acquainted with the whole subject, to introduce to your notice the first resolution. Any diffidence that Lord Russell feels must be felt much more strongly by myself. I think that we, who are in Parliament, shall have opportunities enough of pressing this subject upon both branches of the legislature. I trust that the House of Lords will take a very large and comprehensive view of this question; and I have no doubt that a little discussion there will be necessary as well as in the House of Commons. I certainly hope that my noble friend himself will be obliged to "struggle" there, and I am certain that he will "emerge" from the strife in the most satisfactory manner; but what I do think of the greatest importance is that the gentlemen present, representing so many interests, should have the opportunity of speaking shortly and to the point, with the purpose of influencing not only public opinion, but also the government upon this subject. I have read this morning, with the greatest satisfaction, that portion of Lord Stanley's speech at Bristol—Lord Stanley being himself a most liberal and enlightened friend of education—to the effect that the government are not afraid of this subject, and that they see their way to the introduction of a large, wise, and well-considered measure. Now, I think it of the greatest possible importance, in order to maintain them in that good disposition, and to keep them up to that particular epithet of "large," that men representing the intellectual portion of the public should express their opinions freely on this question. There are only one or two points upon which I should just like to touch. The first is with regard to the universities, public schools, and other existing educational institutions. I believe Mr. Samuelson said, that what is most satisfactory in this respect is, that some move has been made, and that it is to be hoped that further improvements will be made without any compulsion. This can only be done by the influence of public opinion, and I believe that the public opinion

which has been expressed this afternoon will contribute to that end. There has always been a great deal of "fashion" in the modes of education. Those fashions have varied at different times. There are some fashions that have existed, from very early times, which perhaps are getting a little worn-out, and which perhaps might be renewed with advantage. But no doubt the fashions set by such distinguished bodies as universities in this country, influence enormously public opinion as to what really does constitute the highest class of education, besides their practical effect upon schools. I think it of the utmost importance that science should hold its proper position in the universities, but I wish it to be clearly understood that those who take that view, at the same time hold to the fullest extent that science properly taught is one of the best means possible of educating the best faculties of the human mind. I entirely agree with what was said so well by the last speaker, namely, that we ought not to lower the standard of our university education; on the contrary, I want to maintain it as much as possible; but I say, that giving these most important subjects their proper share and chance in the race, is the best way of bringing up university education to the highest possible point. I was so glad to hear one remark made by my noble friend, Lord Russell, with regard to the practice of Harrow School. It was certainly of some advantage that they should introduce scientific teaching in any way, but when it is left heavily weighted in the race to struggle against cricket, you do not give it a fair chance. Therefore I am delighted to hear that the recent practice at Harrow, as I know it is at Rugby and some other large schools, is to include science in the regular curriculum of the school. I am happy to say that I do not believe there is a single person present who disagrees with the beginning of this resolution "Efficient means of primary and secondary instruction should be brought within the reach of the working classes everywhere." I will not trouble you upon that point. Then there is an important addition made at the suggestion of Dr. Playfair, "and encouragement should be given to the study of the elements of science and art in the upper classes of all primary schools which receive aid from Government." I believe that this is most important. I believe that in those science schools one of the great difficulties is that they receive their pupils so utterly ignorant of all elementary knowledge that the scientific school becomes a primary institution instead of what it ought to be. I may mention that I received a letter from the late Inspector of Schools, Mr. Norris, who lately visited a school in Staffordshire, and he told me that he found, with regard to reading, writing, and arithmetic, that invariably those subjects were better taught and better learnt, and by a larger number of children, in those schools where the higher class of education was also given. I now come to one of the most important points, and it is the special institutions that are to give the requisite instruction. On this question we are all deeply indebted to Mr. Samuelson for the information he has given us, both to-day and also in that invaluable letter which he forwarded to the Committee of Council. I should be exceedingly alarmed for these technical schools if they were to compete with the great manufactories by their side, and therefore I would not advocate the addition of workshops to them; but what is wanted is that scientific education should be given with reference to each particular trade—the industry of each locality, and then let it be afterwards applied in the great manufactories. It is most important that we should give unanimous assent to that part of this scheme which provides a certain amount of technical education for the different classes of workmen and foremen and those who superintend the whole work of the manufacture.

Professor J. THOROLD ROGERS (of Oxford) said that although some of the observations that he had intended to address to the meeting had been already anticipated by Mr. Roundell, he still considered it desirable to call

attention to some circumstances that had occurred in the university to which he belonged. It was by no means the case that during the last ten years that university had been careless, for they had founded a vast museum, upon which they had spent a very large amount of money; they had munificently endowed, out of resources obtained from the profits of successful trade (the printing of Bibles and Prayer Books) the professors of physical science, and they had endowed them upon a more liberal scale than the professors of the old studies. They, therefore, he apprehended, could not be charged with being negligent in this respect. The university had no control over colleges or private corporations. The difficulties at Oxford were considerable. First, the expense of an academical education was very great, and the means of obtaining such an education were yearly becoming more and more the sole prerogative of the rich. The poorer class—those persons who might expect to make their way by the study of the physical sciences—had no opportunity of entering the University. The remedy for this state of things was obvious; it was to throw open the universities to such persons as wished to avail themselves of them without being members of any existing college. This, in his opinion, was the only remedy. They might advise, exhort, legislate, do whatever they pleased, but they would never raise their practical students from the half-dozen or the dozen to the hundreds they should be, till the universities were open in the fullest sense of the word. Then another difficulty was the discouragement shown to physical science by the upper classes of society. It could not be lost sight of, that if there had been a real willingness on the part of the noble and wealthy to have physical science studied in this country, the existing state of things would have been reformed long ago. At the present moment the greatest indifference existed amongst the leaders of public opinion towards the study of the sciences to which England owed its greatness. He was the last person in the world to disparage classical literature—and it would be an evil day for the University of Oxford if there were any degradation of the existing standard of education there—but he was of opinion that no alarm need be entertained on this score, for he was sure that the University would take care of its own. They were endeavouring to get rid of the “pass-man,” and he would not allude to the classes from which the pass-men came. He only hoped that those reforms, which were absolutely essential towards the development of physical science in the ancient universities, might be initiated in those places and by those influences through which alone they could be effected. With regard to the means for developing scientific teaching in the country schools, he hoped he might be allowed to remark that there was a vast unknown amount of public charities existing which at present did nought but mischief—he alluded to the dole charities such as those of the city in which he lived. The amount of dole charity distributed annually at Oxford amounted to between two and three thousand pounds, and yet in that city there was not a place of education founded between the college and the school. The sooner these charities would be got rid of the better, and the funds applied to the purposes of education. If it were necessary to discover funds throughout the country for carrying out the contemplated educational measures, he thought there were amply sufficient funds existing in the so-called dole or local charities which are at present only a mischief, but which would then become eminently useful.

Professor LIVING (of Cambridge), expressed his cordial assent to the first part of the resolution, but wished to make a few observations upon the latter portion of it. He thought it only fair to the universities, and only a due encouragement to those who had been making strenuous efforts in them, that it should be publicly known what had been done within a comparatively recent period. When he first went to Cambridge—more than twenty years ago—there was no encouragement for physical science in any

way. It was true they had a number of professors of physical science, and he did not wish to depreciate what they had done. He did not wish to depreciate Sedgwick, Stokes, and others, but beyond their efforts there was literally nothing done in the University of Cambridge to encourage science. There were no libraries, no examinations in which the knowledge could be tested; and no rewards, except a few very small ones, in respect to medical science. Now, however, a very considerable change had taken place in that respect. The university had made great efforts, not only to increase the number of teachers, and to supply them with better endowments, but it had done a great deal within the last few years in providing libraries and museums. They had now a very good library for natural science, provided by the university, and four others by the different colleges, and as far as practical chemistry was concerned a very good provision had been made. They had also built some very large and convenient museums for other branches of science, and their museums for natural history were second to very few. More than this, the university had long since struggled to put physical science upon a par with other branches of learning, and before 1850—before any parliamentary interference—the University of Cambridge instituted examinations for honours in that department of knowledge. With regard to fellowships, no doubt, as long as they were given for classics and mathematics exclusively, physical science must be under a disadvantage; but a great change had been introduced even in that direction, for Trinity and St. John's Colleges had publicly announced that they were giving scholarships for proficiency in physical science.

Mr. EDGAR BOWRING, C.B., in his capacity of Secretary to the Commissioners for the Great Exhibition of 1851, wished to state in a few words what took place in that Commission 15 years ago connected with this question. At the time when those Commissioners found themselves with very large surplus funds in hand they called special attention in their report to the memorials from the leading manufacturing and commercial towns, which indicated clearly the strong feeling entertained by those well entitled to form an opinion upon this subject, of the importance of establishments for instructing those engaged in trade and manufacture in the principles of science and art on which their respective industries depend. While allowing the injustice of the reproach that this country makes no efforts for the promotion of science and art, they confessed that, though a larger amount of money is spent for those objects in this metropolis than perhaps in any country, this is the only country which has not supplied—in any practical or systematic shape—a scientific or artistic instruction to its industrial population, and they pointed out that the Great Exhibition of 1851 had shown that unless this was speedily done this country would run serious risk of losing that position which is now its strength and pride. The recommendations of the Commissioners were divided into two—one relating to the assistance to be given by the Government, and the other on the nature of private institutions, and the Kensington-gore estate had been purchased for the purpose of enabling a central institution to be founded upon it directing the whole movement. Shortly after the publication of this report, Her Majesty invited the assistance of Parliament in advancing education in science and art. In 1855 the French Government bore the highest testimony to the progress made in those branches of our industry relating to art, such as glass, figured silks, and various other fabrics; but, in regard to the manufacturing and mechanical industries, he (Mr. Bowring) was of opinion that England was very rapidly losing that pre-eminent position which she formerly occupied. He considered it of the highest importance that the Government should give every encouragement to the present movement. He believed that building grants for schools would have a favourable influence, and the requisite diagrams and apparatus should also be supplied. He thought the great Exhibitions of the last

few years had been of the greatest value to this country, especially in showing us our deficiencies.

Dr. CRACE CALVERT, F.R.S., said a residence in Manchester for upwards of twenty years had impressed him with the great want of technical instruction among the operative classes engaged in the staple manufactures of that district. It was necessary that in all our manufacturing districts technical lectures should be given especially adapted to the class of manufactures carried on in those districts, and they ought not to be confined to one branch of the manufacture only, but should embrace all its ramifications. Thus in the calico manufacture there should be lectures not only on printing, but also on the art of design as applied to calico printing, as well as on the laws of colour. That class of education was now thoroughly carried out on the Continent, especially at Rouen, Mulhouse, and Lyons. It was desirable, in this country, that young men who showed aptitude in any speciality connected with manufactures should have the opportunity of acquiring a theoretical as well as practical knowledge bearing upon that particular branch of manufacture. The greatest facilities in this respect were given in the places he had mentioned, and the Government of France had lately established a laboratory in Paris, where young men who had distinguished themselves, and had obtained special rewards for aptitude in these matters, had the opportunity of following gratuitously for two years laboratory manipulation and instruction under the most able men of the country. He expressed a strong desire to see a similar system of technical instruction established in this country; and he felt the more strongly on the subject from the high sense he entertained of the benefits which he had personally derived from the system pursued on the Continent.

Mr. FIELD (President of the Birmingham Chamber of Commerce) said—Mr. Samuelson had stated that England was not so far behind, but was still maintaining a great supremacy over the manufactures of other countries. He thought the position of the case was about this—that if the English locomotive on the English railroads was at present ahead of the locomotive in other countries, those who inquired into the speed at which the respective locomotives were going would see that should that same speed be continued much longer, the locomotives of other countries would pass by our English locomotive. He proposed to say a few words with regard to the great falling off in the export of English manufactures to the United States, and to show that, in his opinion, the growth of the manufactures which supplanted the English goods in the United States was due, in a great measure, to the better education which the workmen who produced them received. For more than thirty years he had been engaged in exporting manufactures to the United States, and for half that time he had been resident there, in order to give his personal attention to his business on that side of the Atlantic. He had there struggled to maintain the position of English manufactures against those of the United States, which were supplanting ours. In article after article of American manufacture, as it gradually replaced ours, he had endeavoured to retain the position of our trade. He had sent home descriptions of the articles that were required to be manufactured in order to keep possession of the market. The manufactures of the United States had now largely replaced those of Birmingham and the midland districts of England. Whenever an article produced by American manufacturers was brought into the market, in opposition to those which he dealt in, he almost invariably found it was an article more directly suited to the purpose, and as changes were required the article was produced to fit the new demand. Why could we not follow the same system in England? This supplanting of the English manufactures could not be ascribed to protection. The idea was, that we lost our trade because of the enormous duties that were put upon our goods. He could show that was not the expla-

nation of it. In the first place, our goods had been sup-
planted, not only by the producers of the United States, but also by those of Belgium, France, and Germany—countries whose productions paid as high a duty as ours. Our goods went into the American market under duties varying from 35 to 100 per cent. If it were high duties which kept out our goods, we should find that those on which the highest scale was levied were those which were most kept out. The contrary, however, was the case. Of the goods which we were still able to export from the midland districts, they were largely those which paid extreme duties of 60 to 100 per cent. And what was the reason? The articles which were paying these high duties were those in which there was the least possibility of applying machinery, and the least opportunity of introducing new shapes and patterns—those in which the lowest class of labour was engaged, and this fact sustained the remark he had made, that it was not the protective duties of the United States which kept out our goods, but the increased and growing education and intelligence of their workmen. Besides residing in one of the States for a very long period, he had recently made a journey of several thousand miles through other States, in the course of which he had frequent discussions of this question with those in his own position, more especially with regard to the diminution of the exports of the midland districts. When he was first engaged in the trade the stocks of hardware goods in the United States stores consisted of Birmingham exports, to the extent of about one-third of the whole contents, not allowing for Sheffield; our manufactures in that branch did not now form one-tenth part of the contents of the stores. It had been his growing conviction during the last 30 years that no cause had operated so much in the diminution of our exports to the United States as the superior educational advantages of which the working classes in that country availed themselves with such beneficial results. The workmen of our own country caused an enormous obstacle to the maintenance of the manufacturing exports of the country by their rules of trade and trade associations. Those trade unions no one would object to in principle; the workmen were as much entitled to form a union among themselves as the masters, to protect themselves against injury to their own position; but that protection should be had in a way morally right in itself, and with due regard to the public interests. When they were asked to produce a new article from a pattern sent over from abroad it was opposed by some trade rule. In the hardware trade there was for the most part piece-work, and the workmen were paid stated prices for certain kinds of work. Every article which differed from that which they formerly made became obnoxious to a higher charge for producing it. At the present moment there was a case so apposite that he would put it before the Conference. The negro labourer of the United States used a hoe for hoeing cotton, which was a huge and heavy tool. Before the emancipation of the slaves they were gradually improving in education and intelligence, and they were able to use tools of a superior character. Since the emancipation the negro would not use the tool which was formerly put into his hands. He now wanted a light, handy tool for his purpose. This was an article with regard to which they were at this juncture in the throes of competition with the American manufacturers. He had applied to a manufacturer in his own district to make the requisite changes in the implement, but, according to the rules of the trade, it would become chargeable with a price for manufacture which would be equal to that for a tool two sizes larger, so that the workman would earn more money per day in making the new tool. Now, the American workman was too wise to do this. If our workman got 5s. per day for manufacturing an article, he demanded a sum which would yield him 7s. per day by the time he got used to making the new article, while the workman of the United States would probably be content with adding sixpence a day to his

earnings under similar circumstances; but our own workmen fell back upon the strength they had got in their rules of trade. This was a great obstacle in the way of introducing the necessary changes in our manufactures. The principal articles now manufactured in and exported by, the United States, consisted of spades, shovels, axes, hoes, farming implements, sewing-machines, &c. All these the United States were exporting to the common markets of the world. In Canada, too, he not only found these more important articles, but many other descriptions of hardware goods of United States manufacture, produced at a cost of 50 per cent. more than those of this country, and yet they were supplanting our own goods in Canada. He would now say a very few words with regard to the schools of the United States. That system generally was pretty well known to those present. The schools were free as the German schools were, and they were divided into primary, grammar, and high schools: that was a general rule throughout the States. In Massachusetts, where the school system was perhaps better carried out than in any other state, the compulsory law was enforced. Mr. Bruce, at the educational conference at Manchester, stated that inquiries had been made into the working of the compulsory system of education in Massachusetts, Saxony, Prussia, and Switzerland, and that wherever it was attempted to be grappled with, it was found there was in reality no compulsion at all: and let him (Mr. Field) add this prediction—that should we introduce compulsory education in England, and should Prussia send over a commissioner to inquire how it was managed, and what were the punishments, he would go back and say there was no compulsion in England. When he (Mr. Field) was in Boston recently, he spent some time with Mr. Philbrick, the superintendent of the public schools of Boston, who informed him that the Compulsory and Truant Law had been 23 years in operation in Massachusetts, the punishment for truancy or absenteeism being a fine not exceeding 20 dollars, or committal to a reformatory school for a term not exceeding two years. The number of committals for eleven years, from 1852 to 1862, varied annually from 21 to 81 for truancy, and the punishment in the reformatory school from three months to one year. In Boston four truant officers were appointed, whose duty it was to inquire into absenteeism. Truancy was the chief cause of punishment, and that for absenteeism was seldom required, because there were but few absentees. On looking into the statistics it was found that the class which was most amenable to the punishments of the compulsory law was that of our expatriated fellow countrymen—the English and Irish population of Boston. The school statistics for the year ending July 31st, 1866, showed that in the population of Boston, of about 200,000, the number of children between five and fifteen years of age was 35,225, of whom the number attending public schools was 27,357, and private schools, 4,246, making a total of 31,603, showing that the absence from all schools between five and fifteen from all causes was only about ten per cent., or 3,622. Of those on the books of the schools the average attendance for the year was 93 per cent. He commended these facts to the consideration of those who stood foremost in the movement for compulsory education in this country. They would speedily understand that compulsion came almost to nothing. We, as Anglo-Saxons, ought at least to do what the younger branches of the race had done; and it was impossible that we could longer neglect to adopt a system of education which alone would enable us to maintain our commercial and manufacturing interests among the nations of the earth.

Mr. HAY (Provost of Dundee) begged to offer a few suggestions. He resided in the midst of a large manufacturing population, two-thirds of whom were of the working class, and he had made it his business to ascertain their views on this important subject. He would read the practical views which had been sent to him by the associated trades and workpeople of his town, show-

ing what they considered was required to fit them to compete with the workmen of other nations. He concurred with Mr. Bruce as to the practical means to be taken to secure this object. The statistics of the present working of the Science and Art School in Dundee showed the necessity of some action being taken in this matter. In 1863, the number of pupils attending the Science and Art Department was 3,156; in the next year the number was reduced to 2,315; and in 1865 there were only 1,952 pupils. Another change in the code took place, and such was the effect of it in the instance of Dundee, that the number of pupils this year was only 493, which plainly showed, to his mind, that the present form of government grants to education did not meet the necessities of the working population of the country, and that something more must be done to provide proper institutions for teaching that class of the people in art and science. Mr. Hay then read the following:—

Suggestions on Technical Education by the Working Men's Association of Dundee.

1. Textile Fabrics.—A knowledge of the nature of the fibrous substances, such as flax, jute, hemp, &c., and the best method of treatment during the various processes of manufacture, with the purpose for which each kind is best adapted.
2. The construction of the machinery used in the different branches of industry in the town, the uses of each part, and its adaptability.
3. The Science of Mechanics and Engineering.—To know more about the elasticity of steam; the strength of material required to hold against a given pressure; the amount of power to be expected from a given quantity of coals, &c.; the adaptability of the present land and marine engines, the construction of them, and the strength required in their various parts for a given pressure or power, and the means of testing and ascertaining the same; also the use and adaptability of the mechanical power of the lever, pulley, plane, screw, &c., and the method of calculation suited to each.
4. The proper finishing of textile fabrics; bleaching and dyeing, including a good knowledge of the various chemical compounds used, and the effects of each; the quantities required to produce the different colours suitable to the different kinds of fabrics, and the method of application. Also, in regard to the carpet manufacture, the principle of arranging the colours, so as to produce any given pattern; and also the art of designing the patterns.
5. Ship-building.—The method of modelling vessels; and how, from a given model and dimensions, the tonnage can be determined. Also, the strength of the material required for such tonnage; and the best means of constructing to a given model.
6. Architecture.—How to ascertain the strength of beams, rafters, walls, &c., required for given purposes and dimensions; how to resist the lateral pressure of arches, couples, &c. Also, a knowledge of the orders and styles of architecture; how best to supply a healthful quantity of air without causing draughts; and a knowledge of sculpture, so as to suit the various classes of buildings.
7. That the best mode of instructing the people in these acquirements would be to establish an institution or college in Dundee, for teaching these various branches of knowledge, so endowed and managed as to suit the great body of the working classes of the town, and so arranged that they could take advantage of it without infringing on their limited means.

The Association are of opinion that if some such system were adopted in our large manufacturing towns, the country would soon, in every branch of its trade, successfully compete with all other markets on the Continent; that, in addition to that, they believe that the more refined taste that would be imparted to working men by such an education would make them desire improved dwellings and greater social comfort, while a higher tone of morality would be infused among them, and destitution, vice, and crime be materially lessened.

The CHAIRMAN asked whether, after the discussion that had taken place, it would be convenient that he should now take the sense of the Conference on the first resolution.

Earl GRANVILLE remarked that, as many gentlemen had come from long distances to express their views on this subject, it was very desirable they should, as far as possible, have the opportunity of doing so. He, therefore, suggested that the discussion of the first resolution should be now adjourned, and be resumed until a fixed hour on the following day.

Mr. BRUCE, M.P., begged to offer the suggestion that the discussion of this first resolution should be resumed on the morrow, and be continued till two o'clock. Probably that would give as much time as was necessary.

Mr. AYRTON, M.P., agreed with the desirableness of adjourning the discussion on this resolution.

After some further conversation, the discussion was adjourned to the following day.

The Conference re-assembled on Friday, 24th January, at 12 o'clock; Wm. HAWES, Esq., F.G.S., Chairman of the Council, in the chair.

The discussion on the first resolution was renewed by Mr. HARRY CHESTER, who said that, as he had moved in the Council the resolution under which the Conference was assembled, he naturally desired to say a few words before the question was put. Attention had been called to the fact that the first resolution appeared to rest the extension of technical education upon its effects on the interests of Arts, Manufactures, and Commerce. He wished distinctly to state that the Council by no means took a merely commercial view of the question. Those words were used because the Society under whose auspices the Conference had assembled was incorporated for the encouragement of arts, manufactures, and commerce, and it was in defence of these interests that they were entitled to take up the subject of education in the Society; but he hoped a much larger and broader view of the subject was taken by those present. To use the language of a great parliamentary authority, he hoped they looked at it in a "flesh and blood" point of view, and felt a desire to improve and extend the education of the people of this country, not merely because they thought our manufacturers would then be able to carry on their business in a more efficient manner, but because education conferred great benefits on those who received it, and because they desired to do to others what had already been done to themselves. In making these three great demands which the first resolution makes upon the Legislature, the demand for improvement in education in the universities and great schools was put first, because so long as the upper and middle classes of society remained in their present condition of comparative ignorance of the principles of science and art, it was vain to expect that the artisans of the country and the working classes generally could obtain a good technical education. The higher and upper classes being the employers of the lower classes, were the ultimate judges of their labour; and so long as a country gentleman, for instance, knew little or nothing of geology and the principles of mechanics, it was quite impossible to expect that he could be properly served by a skilful bailiff or foreman, and that he would have labourers under him doing their work with a due attention to the demands of science. The same principle was applicable to mines and manufactures. Unless those who are at the head of a concern understood the principles of those sciences upon which the arts in which they were engaged were founded, it was quite in vain to expect that those arts would be carried out in a skilful manner by those under them. The second demand was, "That efficient, &c., everywhere." It was quite ridiculous to think that good technical instruction could be given to people who were ignorant of the simplest rudiments of education. He was not aware whether any gentleman was present representing the mining institution in Cornwall, but a few days ago he received a letter from Mr. Robert Hunt, pointing out how that very useful institution had comparatively failed—how it had been found impossible to give to the working classes the instruction which they desired to receive in the sciences connected with mining, because of the great imperfections of their elementary education. They were not able to read with sufficient facility to master, with any degree of comfort to themselves, the books put before them, and could not write well enough to take notes of the lectures which they heard, nor were they sufficiently familiar with arithmetic to make the necessary calculations of the percentages of metals in the different ores. And this which was true of the mining population was true of the working classes generally. At the last annual conference of the representatives of Institutions in connection with the Society of Arts, he proposed for discussion the question whether the means of primary education at present at the command of the working classes were sufficient to enable them to profit by the secondary instruction they

desired to receive in the mechanics' and similar Institutes. A very considerable number of the representatives of such bodies were present from all parts of the United Kingdom, and the response was unanimous that at present the means of primary education were altogether deficient. Having expressed a desire that primary education should be extended and improved, the resolution went on to ask for efficient secondary instruction, facilities for which were altogether wanting in this country. The resolution asked that we should have what exists in other countries, good colleges or schools of technical instruction. He did not think a numerous body like the Conference could discuss the details of this question, but it must confine itself to general principles, and the details should be very carefully and deliberately considered, lest the scheme should be started on a wrong basis, and more harm than good be effected. He did not agree with Mr. Dixon, that it was desirable that these colleges should be originated by Government in the great towns. That would be rather like planting trees without roots. But where there was a local desire and determination to establish a school, Government ought to express its willingness to co-operate liberally with local efforts. When Government expressed that willingness, then it must be for the different localities to come forward and say to Government "We want such and such colleges in a particular neighbourhood; we are prepared to do our part to establish and maintain them; but you must give us very liberal assistance in so doing."

Mr. ACLAND, M.P., said, he took the liberty in the committee room yesterday, to request the insertion of the word "secondary" after "primary" in the second branch of the resolution. He wished first to say what he meant by secondary instruction. Contrasting it with primary instruction, he thought the best way to define it was, to look at the time boys were likely to stay at school. On the Continent in primary schools it was not uncommon, and he believed in several countries it was the rule, that scholars should remain till fourteen. Practically, in England, primary education was generally limited by the age of twelve or thirteen. Secondary education in England was therefore best defined as that kind of education which a boy obtained who continued at school beyond the age of twelve or thirteen. He would not say a word about secondary education up to sixteen or eighteen, still less would he touch upon the general question of university education, which was discussed so much yesterday. His chief point was secondary education for aspiring artisans, or for the shopkeepers with small capital, who must begin to earn their living about the age of fourteen, or a little later. In the very remarkable letter of Mr. Samuelson, already referred to, he stated that the workman on the Continent owed his position above all to two things—the knowledge of elementary mathematics and drawing. Under the operation of the revised code, which he (Mr. Acland) did not intend to attack, all promoters of education were well aware that the advantage of learning the "three r's" correctly was purchased somewhat dearly. It was purchased partly by the exclusion of subjects of secondary education, which might in many cases be introduced, and also by a certain rigid stereotyped system, which had a tendency to increase the fault of the English artisan, by making his mind wooden instead of living. It became, therefore, more important that this country should devote itself in earnest to give a sound fundamental education to the children of those artisans who would save from their own enjoyments in order to give their children the blessings of an upward-looking education. Time would not permit him to refer in detail to a remarkable document put into his hand yesterday, the Report of the French Commission on Technical Education. He would only say generally that he observed that, in speaking of England, they said that one of our great difficulties in the advance of technical instruction was the want of fundamental training as the basis of scientific knowledge. He would now pro-

ceeded to state two or three facts, which he had endeavoured to collect for the meeting—his object being to give a stimulus to the English people in the matter under consideration. There were thirteen towns in England having about 100,000 population or more, and in those towns there were two and a half millions of people. Most of them had some kind of secondary or grammar school, but the entire number of scholars in those schools was about fifteen hundred, or rather less. Of those there were only two hundred who were learning any physical science whatever; and even with regard to those who were learning it, he thought it might be very doubtful what kind of science it was, and how far it deserved the name. Of the fifteen hundred, only seven hundred and fifty were learning any mathematics, meaning by mathematics something more than ordinary arithmetic; and of the seven hundred and fifty about two hundred and fifty were in the Manchester school, leaving for the other twelve towns about five hundred scholars. Science was taught to any practical purpose in only two towns—Sheffield and Leeds; and, if he recollected rightly, the total number of boys in the lower grade of education at Manchester below the classical school, in a school that had an endowment of 2,000 a-year, did not exceed fifty. There were twenty-two manufacturing and mining towns of less than 100,000 and over 20,000 population, containing in the aggregate 1,000,000 persons, and in those towns there were rather less than 1,500 scholars, little more than three hundred of whom learned any mathematics, and only about fifty, in four schools, were learning any natural science. With regard to the metropolis, there could be no doubt that the great deficiency of London in education was the almost total want of schools of the lower grade of secondary instruction for the upper artisans and the shopkeepers of moderate capital. And to prove that it was not a deficiency owing to the want of demand, at one of the very few lower grade secondary schools in London, there were a little while ago three hundred boys waiting to be admitted, the terms of the school being, he believed, something under £4 a-year, showing, beyond doubt, that if these schools were established they would be largely sought after by the class in question.

Mr. AYRTON, M.P., said that another school had been established, in which the scholars who were waiting had been admitted, and it was as full as the first school.

Mr. AGLAND—in reference to the central coalfield of England, omitting the extreme north and a portion of the lower end, there were, in 1861, in the west midland division of the Registrar-General, in the north western, including Cheshire and Lancashire, and in Yorkshire, a population exceeding seven and a half millions. There should be at least seventy thousand boys in secondary schools; there were in the endowed grammar schools, the only existing secondary schools of a public nature, fewer than fourteen thousand, and that number included many who were receiving a much worse elementary education than if they were in National and British schools. There were 181 towns in these three divisions, and 76 of them had not any public or secondary school of any kind whatever. By "public" he meant not a proprietary nor a private school; and he wished to point out why he drew the distinction. With regard to the gentry of the country, professional men, and large manufacturers, no doubt a first-class education was to be had in many of the proprietary schools in England; and one of the strong arguments for revising the grammar school system was, that schools with very large endowments and very eminent masters were not filled, because they were not conducted on a system that met the taste of the present day. He was not attacking proprietary nor private schools, because there was not the slightest doubt that many of the private schools in England were admirably discharging a duty which no public school could discharge so efficiently in the same manner, and for the same class of scholars; but with regard to the class to which he de-

sired to confine the remark—the lower grade of the middle class—he begged to impress one especial difficulty upon the meeting. There were a great number of small private schools, which earned a most precarious living amongst the lower middle class, but the practical working of which was very unsatisfactory, and if they became good enough to be really popular, immediately up went the charges, and they ceased to be schools for the class for which they started. Therefore it was absolutely essential that the legislature, and the educated classes of England who inspired the legislature, should apply their minds to establish public schools, under public control, for the lower grade of the middle class. Otherwise, if there were established by voluntary agency the best school that ever was established in a great town, and determined to charge £2 or £3 a year, inevitably the charges would go up, and pass the limit which the poorer classes were able to pay. It became a sort of speculation. The original founders passed away, or it might be a private undertaking from the commencement. They got into difficulties, or they were anxious to improve their teaching; in short, every kind of motive, including the best, influenced the promoters of these schools, and unless the schools were under legal restraint, they would be sure to pass the limit of charges to which he had referred.

The Hon. AUBERON HERBERT said it seemed to him of very great importance that they should all combine, if possible, in what they asked from the Government. Nothing afforded the Government a better excuse for not acting in this matter than the fact that so many different things were asked. If some asked that Government should take the initiative, some that it should help local effort, and others made claims of a different kind, the Government at once felt justified in taking no action upon the matter. The more the subject was considered the more unadvisable it appeared that Government should take the initiative, and the more preferable that it should assist local effort. The reasons for that conclusion were these. The Government had never had a regular educational department. They all knew how that department grew, from small beginnings; and the Government had, at present, no knowledge upon technical education at its command; indeed, he believed the opinion of the country was far in advance of the Government. It was our manufacturers, whose interest it was, that were the only persons fitted to deal with it. No opinion, however, had yet been definitely formed in the country as to what was the best technical education. If the opinions of twenty persons in the room were asked, he would venture to say that twenty different opinions would be given; and he could also venture to say that if any one particular method were taken, and stereotyped in the country at the present moment, with our insufficient knowledge upon the matter, our attention having been so lately turned to such an important subject, it would do more harm than good. Local effort should be encouraged in such a way as to test different systems. Any person who came forward with sufficient belief in his own system, within certain reasonable limits, of course, and any towns possessing the rating power, should hereafter be allowed to follow their own system, and the Government should help them liberally. Should the Bill, which formed the subject of discussion the other day at Manchester, hereafter become law, it would allow a great deal of money, which had been applied by benevolent persons, to be free, and those persons who had originally devoted a great deal of money to primary education would, by having the burden taken off their shoulders, be able, by the Bill, which gave the power of rating, to turn those resources to this higher kind of education. He thought, therefore, there would be found in our large towns plenty of resources which would be willingly turned to this object. With regard to secondary or intermediate schools, he believed Dr. Watts, who was well known in Manchester, had proposed that there should be schools of an intermediate kind above the primary

schools, into which boys, on passing an examination, should be free to enter. To a certain degree this corresponded with the American system, where one school formed a step above the other, and the boys who had made the best use of their time in the school below, passed through an examination to the schools above. With regard to primary schools, he thought Mr. Acland had exactly hit that which was most wanted for them. It would be a very simple thing to ask of the Government that they should add drawing to the "three r's," the effect of which would be very useful in giving accuracy to the hand and eye, and bringing the mind to see that there was a thing beyond the idea. And there was this also in its favour, that it had been largely adopted in France. He found, in looking back to a report of Mr. Matthew Arnold, that taking by hazard forty-two commercial schools out of the Haute Garonne, drawing was taught in twenty-three, and geometry in twenty-seven; and that artistic character that pervades the whole of the French people, that power of observation, and the power of feeling what is beautiful, might very probably be traceable in part to their education in drawing.

Mr. HYDE CLARKE wished to refer to a remark made on the previous day by a gentleman who called the attention of the conference to the experience of fifteen years ago, when the present question was said to be in the same state as now. He (Mr. Clarke) could look back thirty years, and on one side of the room he saw a few of his remaining colleagues of that time, amongst them Mr. George Foggo, who was one of the committee for agitating the subject then; and on the other side he saw the noble earl, then Lord John Russell, who thirty years ago, on the part of the Government, promised a settlement of this very question. He wished, therefore, to urge upon the conference the desirability of its members not meeting again either fifteen or thirty years hence for the prosecution of this subject, but that they should profit by the experience of the past. A good deal had hitherto been done without any results, and if they wished to avoid the errors of the past, they must profit by its experience. He would merely endeavour to enforce the remark of the last speaker, with regard to drawing, as an essential part of elementary instruction. He held that it should be taught in the beginning with reading and writing, as a means of developing the faculties of the children.

Mr. BROOKLEHURST (of Macclesfield) said that his own town had suffered like many other towns for want of technical education among the working classes, and he felt the necessity of increasing the amount of education in science and art amongst all classes. They were very much indebted to the Society of Arts for inviting them to attend this Conference. As Chairman of the Committee for Technical Instruction connected with the Chamber of Commerce at Macclesfield, he ventured to say that, as far as their Committee was concerned, and the feeling generally in Macclesfield, they would readily adopt all the resolutions proposed to the meeting. He was very happy to hear that the Government had taken up the subject, and proposed to introduce a large and well-considered measure. He had felt very strongly for some years upon the subject of the encouragement of science in the universities, which was spoken of yesterday, and was glad that some move in the right direction had been made there. Very little had been said as to the way the idea was to be carried out, but with reference to the appropriation of money which had been devoted to the teaching of the dead languages and mathematics, it was a question in his mind whether that could fairly be done. At Macclesfield there was a Mechanics' Institution, and also a school of art, and he regretted that in 1864, when the Government grant was doing a great deal of good amongst the working classes in the school of art, the grant was reduced from £300 a year to an almost nominal amount. They had been going back ever since. With reference to compulsory education, he considered it already

existed, magistrates now having the power to send ignorant and destitute children to school.

Professor HUXLEY, F.R.S., said he ventured to think that the first part of the resolution might well receive some modification. He entertained no doubt as to the position which science ought to take in general education, as the groundwork of all education worthy of the name; not merely instruction in the facts of science, but discipline in the methods of science. If the Conference, or those gentlemen interested in commercial or manufacturing pursuits, imagined that any good would be attained for their ultimate objects by merely teaching boys those branches of science which immediately applied to their particular trades or callings, and which were merely the scum and top surface of science, they were much mistaken. The minds of the young should be imbued with scientific methods and with scientific principles—less than this would eventuate in a miserable failure. It appeared to him, therefore, that when the Conference asked that "instruction in science and art should be, &c., &c.," it virtually made an admission which was an exceedingly unwise one, and one that in the long-run defeated its own objects. If the conference was not prepared to say that practical training in the methods of science formed the most important part of the basis of the proposed education, he thought it had not fairly comprehended what it had to do. He was not intending to depreciate the value of other studies, least of all the value of instruction in art; but he wished to urge in the strongest terms that instruction in art and literature, valuable and important as they were, both for the training of the mind and fitting men for particular offices, were altogether subordinate and should be secondary to training in science and scientific methods; and he should be quite unable to agree to a resolution which, in his judgment, put science on a footing which was entirely unworthy of it. The second point upon which he wished to offer a remark was, "That efficient means of primary instruction, &c., &c." He did not propose to offer the slightest objection to the spirit of this resolution, but thought it highly desirable that there should be some understanding that this was not a new thing; but, to the credit of the Government, was a thing already in existence. A speaker behind him (Mr. Herbert) made some remarks upon the propriety of looking to people themselves for exertion in regard to education. In principle he (Professor Huxley) heartily and entirely agreed with him. There was nothing which he had fought for all his life so much, whenever he had anything to do with such matters, as for the principle of spontaneous action, and for the avoidance and putting down, in any way, of everything that can be called over-legislation—the interference of Government in any matters, except matters of police and the like; and he heartily wished the facts of the case would enable him to support the views Mr. Herbert took; but as he (Professor Huxley) was supposed to know something of the case, occupying as he did the post of Government Examiner in the department of Science and Art, and being connected with a great technical school in this country, the School of Mines, in Jermyn-street, he believed you could not look to the people of this country to do anything. In consequence of the utterly defective education of the people, they did not know what was good for them, and had not the slightest conception of the methods that should be taken to improve their present ignorant and imperfect condition. He would take as an illustration the School of Mines. Was that established by the general manufacturing interest of this country? Did anybody imagine the manufacturing and mining interest of this country had sufficient intelligence to see that the great thing wanting was scientific instruction to be given to its artisans and inferior employés? That school was established by the energy and determination of a single man, his old chief, Sir Henry De La Beche, who saw the importance of it; "stumped" the manufacturing interest, and persuaded

the manufacturers to join him. He (Prof. Huxley) very much doubted whether even now any considerable portion of them had anything like a clear idea of what they wanted. It was perfectly certain, at any rate, that the mining interest had not taken the advantage of the college that they might have done. It did not occur to them to have their coal viewers and their mining agents instructed in anything more than a mere rule of thumb. He could not say the smallness of the attendance arose from any defect in the teaching—and he could the more readily say this because his teaching did not particularly affect these persons—for there were not fitter and more able men in the country than his colleagues. It was because the great mass of the manufacturing interest did not, even at the present moment, understand that such instruction in the groundwork of technical knowledge was what they wanted to prevent their manufactures from going to ruin. He thought it was very creditable to the Government that it had already spontaneously given encouragement to scientific education in this and in other instances. He referred to the system set on foot in this country some years ago, in connection with the Department of Science and Art. It had a very small beginning. It resulted from a minute by the minister of the day acting *proprio motu*. He did not think that even the House of Commons was consulted; certainly no action was brought to bear on the minister. Payments were proposed to be made to the students in primary schools who showed, by passing primary examinations, that they had received a certain amount of instruction in science. At first there were very few persons examined, but by degrees the number had grown, until last year he had between six and seven hundred papers—fair average papers; and he believed his chemical colleague had twelve or thirteen hundred. Another very important matter was promotion for clever boys. The only body doing anything for clever boys in scientific matters was still, he was sorry to say, the Government; and any such boy in the country, whatever his condition, provided he was not too rich, on passing successfully the examination of the Department of Science and Art, got not only the ornament of a medal, but a solid exhibition, the payment of which was contingent entirely upon his continuing his studies, which he might do at the School of Mines. He might there pass through his curriculum for three years, and at the end of that time, if a clever fellow, he was certain to get a solid and valuable appointment. He believed nobody else said to a boy—"Boy of the dust, work hard, pass a good examination, and a good appointment will be open to you." Until the country was prepared to say it appreciated the efforts of the Government, we must still confess, to our shame, that Government was far ahead of the people.

Prof. FLEEMING JENKIN, F.R.S., thought it was clear, from the previous speeches, that it was necessary to provide scholars as well as professors, and some inducement must be given to young men to enter the classes. It was of no use depending on the public opinion of the country to make them do this. On the principle of the universities giving scholarships and fellowships to successful students, manufacturers should offer employment to the scholars who passed successful examinations, either in the old schools, or the proposed new ones. In his own profession, that of engineering, he would suggest that as the Manchester engineers, for instance, did recognise that a theoretical education might be of advantage to them, they should recognise it in another way, and offer as rewards to the successful candidates the entrance of their works, so that after receiving a certain amount of tuition a clever student should enter as a pupil under some eminent engineer, instead of having to pay a heavy premium, and commence his practical studies in the state of ignorance in which many now enter upon them.

The Rev. ARTHUR RIGG (of Chester) said that thirty years ago he commenced the work of technical education, and had a number of lathes going at one time,

with blacksmiths and carpenters' benches, and a whole range of workshops. He had gained wisdom by experience, and abandoned these, being convinced that workshops in themselves for educational purposes were not wise; they were merely a means of teaching handicraftism, and did not convey any mental instruction. In 1853 he wished to send two of his sons from home, to complete a technical education commenced there; and as upon inquiry throughout the country he could not find a school for them, he sent them to Hanover. The experiment had not been satisfactory, although not altogether a failure. The struggle of thirty years had been to him an up-hill struggle; in no degree, except from private friends, had he met with any encouragement, and he had certainly not met with anything like success. Failures were, however, very instructive lessons, and therefore he was dwelling upon them. The workshop system had been a failure; and if the schemes now proposed were tried under the experimental guidance of localities, they would be failures too. There must be some guiding experienced hand. Another total failure was the attempt to popularize science, and the greater proportion of the present generation would pass away before the ill effects of it would subside. The reason was that there was no mental culture in it. There was no attempt to popularize law, or physic; and he could not help thinking this attempt to popularize science had been a great mistake.

Mr. G. W. CLARKE (of the North Cheshire Chamber of Agriculture) had, in connexion with the Society of Arts and societies associated with it, enjoyed the benefit of some of the attempts that had been made to popularize science, and had it not been for those attempts he did not think the present Conference would have been so large, nor (in some instances) so intelligent. He rose to call the attention of the Conference to one department that had not yet received special attention, the department of Agriculture. France was, in that respect, as well as in many others, ahead of us; for it had not only elementary, but advanced schools for practically teaching agriculture and the sciences allied to it. With regard to government action, much had been said against revised codes and departments; but, as a manager of schools, he must confess a great deal of gratitude for the painstaking and patient manner in which the educational department of the State had been carried out by the present and the previous administrations. He thought that if there were a little more consideration on the part of provincial school managers, and a little more attention paid by those whose names were nominally on the list of managers, but who left too much to an over-tasked parochial clergy, we should hear fewer complaints of the government, and see better results under any code that might be instituted. He represented one of those new bodies which had sprung up in consequence of the cattle plague, and which now included many thousands of members, from the highest owner of the soil to the most humble tenant; and he thought this was, perhaps, the greatest opportunity the Society of Arts ever had of spreading its influence through the ramifications of these institutions, and reaching those who had been charged so often with being backward in appreciating the advantages of education, whether technical or primary. He trusted his observations upon this subject would not be lost upon the Conference when they came to select the committee, and that it would include representatives of the chambers of commerce and agriculture and mayors of corporations, and not adopt the fallacy, as it sometimes proved, that the smaller a committee was the better.

Mr. LUBBART said that one of the speakers yesterday had given as a reason why commerce was departing from the country that the working classes could not be induced to alter patterns; but the fact was that it was the manufacturers who liked to work a pattern for years, because they knew they could get a certain profit out of it. He believed that he himself would be a much better workman if

he had a technical education. He agreed to the whole of the resolution, as far as he understood it, and he begged to propose an addition, which would meet a present want. What working men wanted in London and in the centres of the manufacturing districts was a South Kensington Museum, and he would point out a spot in London where one could be very advantageously placed. It was situated about half-way between Finsbury-square and the Angel at Islington. There were in that district half a million of men, women, and children supported by, more or less, artistic labour; and an institution similar to the one at South Kensington would be extremely useful to working men, if it were erected in such a locality. He believed the reason why the upper classes erred in legislating for working men was because they did not go amongst them to know what they really desired. He thought such a museum as he proposed should contain a collection of specimens of food, for there was no doubt the working classes of the country would be all the better if they had only some means of knowing "what to eat, drink, and avoid." In speaking as he did, he did not wish to be considered as advocating the interests of his own class alone; indeed, he was for doing away with class feelings, and wished the whole people to be considered as one, so that what was done should be done for the benefit of all.

The CHAIRMAN read the amendment, "And that national museums of art manufacture be established in the centres of our manufactories, both in London and the provinces."

Mr. GEORGE GODWIN, F.R.S., seconded the amendment, but observed that it seemed to be so much a matter of detail, that it would be taken up by the committee to be appointed. Perhaps with that explanation Mr. Lueraft would waive his amendment, or would agree to the words "special institutions for technical instruction, and museums adapted, &c., &c."

Mr. LUERAFT assented.

The addition of the proposed words was then agreed to.

Mr. GEORGE GODWIN said he believed all who had thought upon the subject were of opinion that scarcely anything need be said as to the desirability of the general assertions contained in the resolution. Surely no one wanted to be informed that very great ignorance prevailed out of doors; and no one wanted now to be informed that some means of removing that ignorance were needed. The mode of doing it still remained somewhat a difficulty; but it did not seem to him that could be properly discussed within the terms of the resolution. Within a very few weeks he had been more than ever impressed with the very great want, not of technical instruction only, but of instruction at all throughout the masses of the country. Lord Russell spoke yesterday of the caution which even Galileo showed, and of the desirability that we should follow his example; but that caution did not save Galileo; and he thought it was quite time that now we should almost give up caution, and that those who felt the enormous importance of education should call for it strongly, not by-and-bye, but now. There was no time to wait; and really it was almost nonsense to talk of technical instruction in the extraordinary absence of primary instruction. It had been pointed out that there were means of technical instruction already provided by the Government; but it was of no use giving those means, unless the people were prepared to take advantage of them; and he contended that at present they were not prepared, and that we were bound at this moment to call for the putting aside all the caprices of cliques, and the opinions of sects, and insisting upon every child having education;—that if every child had not a right to education, it was the duty of every man at least to see that he had it.

Mr. JONES would like to know whether it was intended that the proposed schools should be established by law and supported by Government contributions, as in that case he would object. He was engaged in the management of a voluntary technical institution called the British Horological Institution, and it appeared to him that similar

institutions would meet the want that was now felt. He would certainly object to any burden for his particular trade being put upon the nation. He was anxious some movement should take place among the old City companies, and that they should interest themselves as they once did in teaching their apprentices their respective trades.

Mr. MEYER (from Hanover) contrasted the state of education in his own country and in England, and urged upon the conference the importance of persevering in the endeavour to improve our educational condition.

Mr. AYRTON, M.P.—My friend in the chair has asked me to address to you a few remarks, and he has probably done so because this Society has done me the honour to print in its *Journal*, and circulate amongst its members, a letter which I addressed officially two years ago to my noble friend Lord Granville, when President of the Council, in which I suggested three propositions: first, that there ought to be science schools of the highest order in this metropolis; secondly, that they ought to be placed where they are most accessible to those who are likely to resort to them; and thirdly, that the great work of establishing them ought to be carried on by the great endowments, which I thought were a primary fund for that purpose; and I am happy to be able to say that Lord Granville himself, as the President, and my right hon. friend, Mr. Bruce, as the Vice-President of the Council, entirely acquiesced in the view, that those were propositions that ought to be immediately considered practically in Parliament for the purpose of being realised. But they know, and I know, that it did not rest with them or with me to make either the House of Lords or the House of Commons take that course. If it had, instead of being now on the threshold of the subject, we should have been so far advanced in it that we should have in our hands the Act of Parliament to carry it out. However strong your opinions here may be, you cannot conceive the strength of antagonistic opinions elsewhere; and I am sorry to say more especially in Parliament. I think we ought to understand the full extent of the opinions that we have come to maintain. We ought to believe in them, and we ought all to resolve to be apostles of them. Now, I make this assertion, that a man who is well educated in the grammar and literature of his own language, and in science, taken in a full and comprehensive sense, is as well educated for every purpose of life, and for every occupation and pursuit in this country, as the best man that is turned out of either Oxford or Cambridge in Latin and Greek. That I take to be the view held here to day. Anything short of that will not do. But for this scientific education, which we all desire for thousands and tens of thousands of people, I ask myself in vain, "Where are the masters to teach them?" and that is the most difficult point of this question. You are compelled, therefore, to keep your claims for scientific teaching within certain limits. But what we are bound to claim is this—that, in the universities, such an education as we contend for shall receive the same high consideration, and the same amount of actual reward, as education in Latin and Greek. I deny that this is the case at present. But when I say that, I do not wish to blame the universities, for this simple reason—it is the essence of a university that it must be based upon the schools of the country. There can be no such thing as a university-teaching unless there are schools upon which that university is to proceed, and upon which it is based. At present there are nothing but Latin and Greek schools, and therefore you get nothing but a Latin and Greek university. This brings us to the question of the school. It is obvious that a real science school, in the grand view of Professor Huxley, is the pivot on which the whole question turns. It is the means by which you must reform your university teaching, because a good science school throughout the country will compel the universities to do honour to what is taught in

these schools. It is a hopeless proposition, a scientific education in a primary, or even in a secondary, school; that is, a scientific education of the high pretensions of Professor Huxley. But, though you cannot do this, you can find out in the secondary, and even in the primary schools, the latent genius of the country. You can take it out of those schools, and you can send it, at the expense of the great educational endowments of the country, into a great school of science, where it shall be brought to the highest development. That is, I think, the way in which we must understand the proposition, when we speak of all classes of schools getting the benefit of teaching in science and art. We are not to be deterred, because there are half-a-dozen ways suggested of doing a thing, from attempting to accomplish it. It is rather a source of encouragement that there are so many different ways suggested by which you hope to accomplish the end. We leave these ways to a subsequent consideration by a practical committee. Upon this principle, then, I think we may recognise the propriety of the resolution which has been submitted to the meeting.

Dr. LYON PLAYFAIR—Sir, I congratulate this meeting upon the unanimity with which this resolution has been received. I have only one or two words to say with reference to it. One of the points which have been brought before us, and a very important one—one really at the basis of the whole question—is the action which our great universities in this kingdom will take in the matter. The education of the middle classes is exactly what the universities choose to make that education; and I would therefore draw attention to what has been stated by the representatives of the two great universities. It is quite true that the universities have awakened, and are moving, and we congratulate them upon the movement; but they are doing very little in comparison with what they can do, and what we ask them to do, when we say, "Put science upon equal conditions with other branches of learning." Four or five fellowships in Oxford would represent, taking £300 a year for each, about £1,200, which is given. Oxford will, as soon as the new ordinances come into full effect, have 300 fellowships, and expend annually upon them about £90,000; and therefore we say they have made a mere beginning, which we congratulate them upon, but it is nothing to what we expect them to do. Then again, besides these 300 fellowships, they have 500 scholarships. I am not aware whether one is given for science.

Mr. ACLAND—Several.

Dr. LYON PLAYFAIR—I am glad to find there are several. At all events we should be very glad if we got a due proportion of the 500. Let us not be alarmed about the funds that we require. Many of us are jealous of comparing what France and Germany are doing in this matter, and think it not suitable to our own country. Let us look to what America is doing, in all its troubles. In 1862 America passed an Act of Congress, which has not become very active on account of the war, but which will presently become active. America passed an Act of Congress giving, for the establishment of thirty-seven agricultural and technical schools—one for each state—no less than 9,500,000 acres of land. Only allowing one dollar per acre as the value of that land, America gave, for the foundation of technical schools, two millions of money, not one farthing of which was to be spent in buildings, but for the endowment of the teachers. And we will soon see what an immense result this produces. Then, finally, let me express my entire concurrence in what has been said with regard to endowments. My own city is a remarkable example of these splendid endowments. Those who have visited Edinburgh admire the splendid edifices—Donaldson's Hospital, Heriot's Hospital, and the like. What have these done for education practically? They have pauperised the middle classes, and taken away their self dependence. So far as I have looked into it, they have not produced a man of eminence. They are splendid endowments; they are very jealous in telling us

what their annual value is; my impression is they amount to nearly £50,000 per annum. And we produce nothing out of that; whereas we could, by imitating what America has done, produce the greatest benefits. One remark more, and it is this. The general character of our schools represents gradation in education. All of us have pointed to the success of Scotchmen on account of the education that they receive. How is that? Because practically, until lately, Scotch education was compulsory education, and an education of gradation, because the Kirk Sessions, who ruled from the religious influence in Scotland the feeling of Scotland, acted in this way; and if you look at the old records of the Kirk Session you will see it. It is reported to the Kirk Session that A. B., a child, does not attend school. An elder is sent to ask why he does not attend school. "Because he has no clothes." The Kirk Session says, "Supply a suit of clothes to A. B., and force him to go to school, and tell the parents if he does not, church privileges will be withdrawn from them." Then, again, if you look at the records of the Kirk Session you will find it says this:—"There is a boy of pregnant parts. Make a collection in the church for him; send him to the University of St. Andrew's, to Aberdeen, or to Edinburgh, and educate him at the public expense." These are the things that have made Scotchmen what they are. When the public feeling of England and Ireland moves in the same direction similar results will follow.

The CHAIRMAN then read the resolution as amended, as follows:—

"That to establish and maintain a system of technical education adequate to the requirements of arts, manufactures, and commerce in the United Kingdom, the three following educational reforms should be effected:—1st. In the universities, grammar schools, and other educational institutions for the upper and middle classes of society, instruction in science and art should be placed on the same favourable footing as other studies; 2nd. Efficient means of primary and secondary instruction should be brought within the reach of the working classes everywhere, and encouragement should be given to the study of the elements of science and art in the upper classes of all primary schools which receive aid from Government; and 3rd. Special institutions for technical instruction, including museums, adapted to the wants of the various classes of society, and to the industries of the country, should be established and maintained in the United Kingdom."

The CHAIRMAN then put the resolution, which was carried.

Mr. HARRY CHESTER said—The resolution which I have to propose is this—"That in such measures as may be desirable for the general provision of the means of efficient primary and secondary education, it would be right to consolidate and improve, rather than overthrow, what has already been done; but that the voluntary principle requires to be supplemented by local rates for education." Now this resolution, although it seems to contain three, only contains two propositions. The first is that we do not desire to overthrow—merely to improve—the action of the voluntary principle; the second, that we cannot consent any longer to forego the existence of rating powers for education. It stands to reason that, where so much is wanted, we ought not to begin by overthrowing what exists, more particularly when that which already exists is good, and is capable of being made much better. It should not be forgotten that from 10,000 to 15,000 of the best primary schools in this country are now existing under trusts settled by the Committee of Council, which depend for their very existence on the maintenance of the voluntary principle. The management of these schools, instead of being vested, as it otherwise would often have been, in the clergyman of the parish alone, is vested in the clergyman and a considerable number of his lay parishioners whose qualification is their voluntary contribution towards the maintenance of the schools. It would be very foolish to begin by throwing those subscriptions aside and alienating all those friends of education, more particularly as they stood in the gap when it was much wider than it is now, and to them we are principally

indebted for such means of education as we already have. If we declare against the voluntary principle, we add greatly to the difficulty of carrying through Parliament that large measure of education which Lord Stanley, in his speech at Bristol, tells us that the cabinet contemplate introducing. But the voluntary principle, although a very good servant, is by no means a good master. I am convinced that it is impossible upon the voluntary principle alone to reach all the neglected parts of the country, either the rural parishes or the great towns, and to supply them with efficient means of education. Moreover, if we throw aside the voluntary principle as an agent for supplying the means of education, we must do so not only in connexion with the primary schools, but also in connexion with the Mechanics' Institutions, which supply both primary and secondary instruction. What I maintain, therefore, is that we should hold out the hand of fellowship to those who will act on the voluntary principle, while we insist upon the power of levying rates in aid. Many persons are afraid of rates, because they think that if you have a rate it will not be possible that a school so supported should co-exist by the side of a school supported by voluntary effort. What we must have, without any more trifling, is a complete scheme of education for the whole of the population of this country. We cannot get that unless we have power to levy rates, and, therefore, I say let us have rates. I believe that schools supported by voluntary subscriptions and schools supported by rates may co-exist in different places, and even in the same place; and that, by good arrangements, the same schools may be supported partly by rates, partly by voluntary subscriptions, partly by grants from the Committee of Council, and partly by school fees; but if this belief should be illusory, if rates should destroy subscriptions, this can only be by the greater strength of the rating principle; and, at any cost, the people must be educated. I am sorry to say that Mr. Göschen, who was to have seconded this motion, is prevented from coming here at this moment, but Mr. Cowper will undertake that office.

The Right Hon. WM. COWPER, M.P., said, in seconding this resolution—I need only say that we have before us a very good and a very great undertaking, namely, that of endeavouring to render the education of this country more suitable to the knowledge we require, and more adapted to the wants of the times; and having so large an undertaking as that before us, do not let us add to it any attempt to enter into an antagonism with any of the existing bodies which hitherto have promoted and supported education. This resolution deals with the education of those classes who are assumed not to be rich enough to provide proper education for themselves, and therefore their education cannot be paid for by the parents. We should not like it to be thrown entirely upon the voluntary principle, but yet do not let us slight those great exertions that have been so successfully made by persons interested in education in the country, by the clergy and by various committees who carry on their work humbly and efficiently. On the other hand do not let us treat lightly the responsibility of government in regard to education. There are many who are rather inclined to think that government need not meddle in this matter; but I do hope nothing will be done which may tend to foster that idea in the mind of those who are likely to influence the affairs of the country, but rather to make them feel that as the education of the middle classes is a matter of immense national interest, so it is a matter in which the national will, and the representatives of the people should also take a most prominent part. Can we for a moment doubt that it is of the greatest national importance at the present time that there should be a large improvement in scientific and technical education amongst all that portion of the working classes, or of the middle classes, who are capable of receiving the education of which we speak? Is it not hard upon our

energetic, patient, and skilled workmen, that they should be exposed to competition with the workmen of other countries without having the same advantages which are given in almost every country on the Continent, of schools promoted, as they all are, on the Continent by the government, and receiving a central direction, a central guidance, and a central superintendence. Let us assume in all our future proceedings that we must still have the schools supported by the parents of the children, by voluntary efforts, and by the Imperial Government. But we desire to add a fourth body, namely, the municipal or the parochial organisations. That assistance I am sure is absolutely necessary to the efficient working of the system; it will bring in a force of public opinion to bear upon the subject which is especially wanted now, for one of the main causes why education has not been successfully carried on is the want of the power of public opinion to bear upon it. We all know that the great reason why the schools are not filled is because the parents do not care about it. They require to be influenced by public opinion, by the persons resident in the locality. Let us have all the powers of the nation acting concurrently in this great matter, and there is a hope that this great defect, which has been so fully recognised during the discussion of yesterday and to-day, may be effectually remedied.

The Right Hon. H. A. BAUGH, M.P.—I think I may assume that there is a unanimous feeling in favour of this second resolution, and, if so, I ask would it not be wise to carry it by acclamation, and to proceed at once to the next resolution, upon which an important amendment will be moved by Mr. Chester, which will evoke the opinions of the meeting as to the question of compulsory education.

Mr. CLARKE proposed as an amendment, that the words "aided by Government" be inserted in the resolution, which would then read thus—"but that the voluntary principle, aided by Government, requires to be supplemented by local rates for education."

The amendment was not seconded.

The CHAIRMAN then put the resolution, which was carried by a large majority.

The Rev. W. C. LAKE said—The resolution which has just been put in my hands is this: "That while this Conference acknowledges the benefits which have ensued from the educational clauses of the Factory Acts, it is of opinion that the legislature ought now to declare that all children between certain ages, employed in remunerative labour of a certain character, should receive education during at least a minimum number of hours in each year, security being taken that the education be conducted in efficient schools." Perhaps the reason why I have been asked to move this resolution is because I have, at various times, expressed a strong opinion that whatever you may do in the way of encouraging education, you will scarcely entirely succeed unless you introduce in some shape or other the influence of compulsion. I am not one of those who would for a moment disparage all that has been done during the last 20 or 30 years in the cause of education. I think that all who have laboured in that cause (and perhaps I, being a clergyman myself, may venture to say that I think my brethren of the clergy have taken a very large share in that work), have advanced education in this country immeasurably, considering the state in which it was at the commencement; but at the same time you must face this fact, that we have at the present time, with all possible means applied to education, one-half the children of the country who do not receive an education worthy of the name. I will not now discuss the question, what is the exact number of children in the streets of London who are receiving no education at all. I think it very possible that there is a very small number of them who never at any time enter a school; but the education they receive is often not worthy of the name. Supposing that most of our children at broken intervals for three or four years, between the ages of, say, three or four and twelve or thirteen, attend for some fifty days in

the year at school, do you think that they really carry off anything worthy of the name of education? What we wish to induce them to do, and what other countries have managed that they should do, is that they should attend with regularity for—I would not ask for any exaggerated number of years, but say for four or five years continuously. That would get something into their heads. How are you to meet this case? You will never really meet it if you are afraid of that word, which sounds so ugly to English ears, “compulsion.” I must honestly confess that I wish we could get some pleasanter word. I would very much prefer that it should be “moral suasion” or “inducement.” But, call it what you will, you must in some way or other compel a large proportion of the children to attend school. The question is, how is that to be done? I frankly admit that it cannot be done by direct compulsion. I do not believe that if you proposed at this moment an Act which was to say that every parent shall be fined whose child does not attend school, it would have a chance of passing the Legislature, or that if it did it would have the chance of being accepted by public opinion. What would I do, then? I should venture to say, enforce those clauses in the Factories Act with regard to industrial schools—enforce some of the clauses which, I think, were passed last session of Parliament with regard to children employed in bleaching operations, and extend the principle of those clauses to agricultural labour. An immense step that would be. I know it would be a difficult step, but there have been means suggested by which, I think, that step could be taken. If you adopt that plan you get in the thin end of the wedge, and offer a strong inducement to the parents, to the employers of labour, and to every one who has influence over the children, and you, in fact, compel large sections of the children to go to school, and you cut off that small section which belongs to parents indifferent or vicious, and who, when once there is something of public opinion established with regard to other classes of children, may be dealt with as being really fit subjects for direct compulsion. This, then, is the course I would take. I would not be in a hurry. I would not lay myself open to any charges of acting rashly or harshly, or appearing in any way to force foreign methods of compulsion upon our people; but, nevertheless, I hold that education will not take root, nor that it is not sufficiently loved by the English mind—that for various reasons the feeling of a great number of classes of Englishmen is not an educational feeling, and that, on all those accounts, unless you go firmly to work, and bear in mind that compulsion in some form must be used, you will not have done your work effectually. I beg to propose the resolution which I have read.

MR. ANTONIO BRADY, in seconding the resolution, said that having taken great interest in the subject of the education of the poor at the East-end of London, he considered it a lamentable fact, that notwithstanding all that had been done in that locality, a very large proportion of the children of the poorer classes received no education at all, in the sense in which it was understood by the meeting; and they might depend upon it, that unless they educated the people for good, the devil was educating them for evil in the alleys and courts of our crowded cities. The great problem seemed to him to be how are we to get the little Arabs in the streets trained in our schools. As a churchman, he was afraid he must confess that with our present organisation we had not achieved that end. He saw no remedy for this state of things except some means of compulsion, which might almost be interpreted by the word persuasion. For several years past he had been asked to distribute the prizes at a large school at Poplar; he was going to do so again that evening; and if any gentleman felt an interest in knowing what was being done at that school in the shape of education, under the careful training of Mr. Holmes, the incumbent of St. Michael's, Poplar, he would invite him to accompany him thither.

He was, however, afraid that the only hope of getting the children to school who did not attend, was by some measure of compulsion. He thought that the parents of these children had yet to learn the benefit which was to be derived from attending school; and he was perfectly sure that magistrates, as well as Poor-law Guardians, would say that it was much better to educate children than to coerce them by punishment after they had committed crimes. He believed it was the duty of the State to educate children, and instruct them in well-doing; and that there was no greater curse to the land than the way in which children, in all our large towns, were being educated in crime, for want of being taught better. He did not believe the children were inherently bad; but inasmuch as from force of circumstances they were tempted to crime, it was the duty of the people of this country to teach them to earn their bread in an honest manner. He thought the best means to that end was, in the first instance, to give them an education in our primary schools which was worth having. He did not think, from his late experience, that any difficulty would be found in persuading parents to pay for the education of their children. He did not think that our ragged schools met with as much support as they ought to receive, for the managers of them were obliged, in his neighbourhood, to bribe the children to come to school, by giving them clothes or meals as an inducement to attend. He confessed that he felt very strongly the necessity for some better means of coercion or inducement than was at present possessed, but how that was to be carried out in this great and free country he was afraid his experience did not enable him to point out. Again, he did not think there was any way of making schools thoroughly efficient for their purpose except by putting them under the inspection of competent Government officers. He had had a great deal of experience of schools, both under inspection and not under inspection, and he attached very great value to the inspection given by her Majesty's officers. The University of Cambridge middle class examiner, Archdeacon Emery, lately examined one of the primary schools in his (Mr. Brady's) neighbourhood, for the purpose of ascertaining to whom prizes were due. The boys in the upper classes answered with such extraordinary accuracy, that it was difficult to determine which were the best. In some cases every boy answered every question correctly. He attributed this success not only to the skill and care of the efficient master, but also to the care with which her Majesty's inspector had also done his duty. Now what he (Mr. Brady) desired to point out was, that the same examiner in the case of the middle class and grammar schools found a lamentable deficiency, both as regarded accuracy and extent of knowledge. The inference was, that unless the grammar schools improved their teaching, which he submitted could be best accomplished by inspection by an independent officer, the middle classes of this country would soon lose their position, for, as he had shown, the lower classes were already treading very closely on their heels.

MR. TRELAWNY SAUNDERS said that by the resolution it was provided that all children between certain ages employed in remunerative labour should receive education for at least a minimum number of hours in each year. He asked how was this to be done? He was answered, “By means of the legislature.” What had the last speaker told them? Why that, under the superintendence of the legislature, national schools at the present moment were really giving a superior education to that which the middle schools in his own neighbourhood give. He (Mr. Saunders) would tell them more, namely, that the operation of the Government in a neighbouring county, not far from our own, in directing the administration of the education of the lowest classes, had had the effect of practically destroying the means of education of the middle classes, and had left, as a result, the necessity of considering whether higher education should not be taught in the primary schools—whether, if Ireland is to

learn mathematics and classics, she must be taught in the national schools of the country. Was this the condition to which England was to be brought? Were we to go on legislating for the poorer classes, and were we ourselves as employers or proprietors to neglect the very advantages which we saw telling with effect upon the lowest stratum of society? Could they be surprised when they found these men rising up in arms against them, and claiming privileges which were likely to affect the political condition of the country? If we had eyes to see, we must see that that which had produced such an effect upon the lower classes of society ought not to be neglected by ourselves. How was that which was mentioned in the previous resolution to be done? He believed that the course to be pursued was the one enunciated in the following propositions, which he was about to submit to the meeting, and he wished it to be understood that he used the word "practical" as a wider term than "technical" when he spoke of instruction. His propositions were:—

"That to secure the benefit of practical instruction for all classes in the various pursuits of life, and to provide a wise adaptation of schools to the general wants and personal incidents of national training, it is necessary to place all universities, colleges, and schools—technical, upper, middle, and primary—under the supervision and control of a Minister of State responsible to the Crown and Parliament."

"That the various officials, conductors, and teachers of every grade, should be constituted as a branch of the public service, be appointed by the Minister of State, and through that authority derive those advantages of promotion, honours, and rewards which are found to be essential in other professions."

"That attention to local interests be secured by the contributions and superintendence of the ratepaying public in counties, townships, and boroughs."

"That, besides the contributions from local rates and the fees of students, the revenues of the department be provided from the property now in possession of the universities, colleges, foundation schools, and other funds of the like nature, with such further sums as Parliament may vote for the purpose."

He asked the meeting whether they were prepared to go the length of affirming these propositions. If not they were only prepared with half-measures. If they were not prepared to go as far as this they must be prepared to play second fiddle to France and Germany. A poor lad from the agricultural districts of France, for instance, attracted the attention of a gentleman in the neighbourhood, who sent him to school. The schoolmaster said, "You must do more than send him to school; he is talented; don't send him to the plough, send him to get a student's education." And the boy was properly educated. In the next grade of school, whatever it might be, there was still a higher position to which he could be carried, and at last you perhaps got a lad showing a capacity for art, and he was sent by the government to complete his education. He (Mr. Saunders) had been told in that room that such a thing might be done here. Who knew it? Nobody knew anything at all about it. The government was at the head of the people in the matter; the people were slow, and the thing was new to them. They were slow in progressing with new ideas. Public opinion must be stirred up, and he hoped it would be seen that the course he had suggested was the right one.

Mr. HARRY CHESTER said—Before I move the amendment, of which I gave notice yesterday, I wish to say, in reference to what has fallen from the last speaker, that I agree very much in many of the things which he has said, but that in my opinion they are not proper to be brought forward as an amendment to the resolution now before us, which aims at one particular point. If we are to debate the question whether we are to have a Minister of Public Instruction in this country, I, for one, am perfectly prepared to vote for that. I submit, however, that we cannot do justice to that matter now, but I have no doubt that at a future time we might discuss it with advantage. The question before us is this—Whether the educational clauses of the Factories Acts shall not only be carried further than they have hitherto been carried, but whether the compulsory powers of education, which the mover and seconder of the third resolution both desire, and I believe the meeting

generally desires, shall be made universal in respect to the children of all classes.

The Rev. W. C. LAKE said—I especially guarded myself against any wish that they should *now* be made universal.

Mr. CHESTER—I understood you to say that we could not educate the people without compulsion, and that compulsion we must have.

The Rev. W. C. LAKE—Ultimately.

Mr. CHESTER—We, doubtless, all agree that the principle of compulsion is an unpopular and unpleasant principle. We do not desire to see that principle applied unnecessarily, but I am perfectly convinced that it is absolutely necessary to apply it for the education of the people; and that it is of the utmost possible importance that in applying it we should leave no doubt whatever that we are not legislating against the poor and in favour of the rich. I am perfectly convinced, from communications which I have had with working men, that this principle is becoming very popular with them; that directly they understand what is meant, that we desire not to legislate against the parents but in favour of the children, that the right, which Lord Russell called the "moral right," of every child in this country to receive education, should also be made his legal right, the working men are on our side. I am perfectly ready to acknowledge, with gratitude, the benefit conferred on the country by the operation of the clauses of the Factories Acts, but I contend that it is altogether vicious in its principle, in affecting only those who bring up their children in industry, and who endeavour to employ them in remunerative labour. This is a mistake, and the sooner we give up the principle, and lay down the true principle of justice, that *all* children, no matter to whom they belong, are entitled to receive education, the better it will be for us, and the more popular will the measure be with the working classes. Let us not go on enacting that the industrious child must go to school, but the idle and depraved child need not, but may remain in the gutter. Let us pass a law that will operate on all classes, and not merely on the industrial poor. In every other country where compulsory education is established by law this is the case; and this ought to be the law in England. Let us lay down at once this principle, and if we do not do that I am thoroughly convinced that the first Parliament that meets under the new Reform Act will pass a bill to that effect. Of course I am aware that the principle, when laid down, must be applied gradually and cautiously. I move that the words that stood in the first draft of this resolution, "that all children between certain ages, and *not those only who are employed in remunerative labour of a certain character,*" &c., &c., shall be inserted.

Prof. THOROLD ROGERS said—I have great pleasure in seconding the amendment which has been proposed by Mr. Chester. I think that the necessity is urgent, and that no time is so good as the present. The facts, I believe, are pretty much as follow:—There are in Great Britain 5,000,000 children between the ages of five and thirteen. Of those 5,000,000 children about a million and a quarter are under the inspection of the Government. There may be a million and a quarter more educated in private schools not under inspection. The remaining two millions and a half, or thereabouts, go absolutely without education. At the present time, undoubtedly, a great many children who receive assisted education through the operation of the Government grant would get that education equally, perhaps, by means of voluntary action and through the system which prevailed before the Government grant was given, and more so, as persons are generally convinced of the necessity of giving this education at the present time. But those persons who do not receive any education under the Government system, and who would not receive any education by any voluntary system, are left to grow up paupers—to become of the criminal class and gaol-birds. It is our duty, if we look

at the state of the case from the simplest economical point of view, to consider that the first obligation and first act of wisdom on the part of a State is to provide education. No man, whatever be his condition, should hesitate to give evidence to the State that his children are being properly educated. As far as I am concerned I must say that I should feel myself just as much bound to submit my own children to the Government test as the children of the poor. It is only by all classes acting up to the obligation which shall be laid on all, that any proof can be given that we are really in earnest in demanding that education shall be given to the poorer classes. It is said that there are difficulties in the way of this—that you must have evidence of the proficiency of the teaching. I see no reason why we should not have examinations for governesses, the same as we have for school-mistresses under the revised code. There is no reason, I think, why this system should not be extended to girls as well as to boys, and why the demand should not be made from the parents and guardians of children that the same evidence which is required from the poorest should be demanded from the richest. I think that the evil is urgent. It is not merely with reference to that point which we are debating—technical education—but education altogether. Any scheme will be little better than a waste and an expense, unless we look the difficulty fairly in the face—unless we acknowledge that education is as necessary to a child as food and drink, and that therefore the community shall demand that all children, in whatever state of life they may be, should be properly educated. I am exceedingly glad to second this amendment, and I hope the Conference will accept it.

Mr. Bruce said—Mr. Chester has told you that the word compulsion is a word which is not popular to English ears, and I quite agree with that remark. In rising, as I do, to object to the adoption of this amendment, I hope it will not be understood that I am at all averse to the principle of compulsion, but the resolution is that we shall now proceed to do this. Those who will have charge of the bill in the House of Commons have already a heavy task—heavy enough for their powers, in carrying in Parliament the principle of a compulsory rate. My fear is, that if we try for too much at once we shall endanger the great good which I think is fairly within our reach. I do not agree with Lord John Manners when he says that it is not the persuasion of the birch, but the fear of imprisonment, that drives the Prussian to school. I have not the same objection that Mr. Baines has to penalties. I see nothing un-English in forcing a parent to do his duty; but I ask myself as a practical man, have I a scheme which I could offer with reasonable expectation of its being accepted by Parliament, and which I could assure Parliament, in my belief, would be workable throughout the country? I ask myself, first, what is the experience of countries that have tried compulsion? Under what circumstances have they tried it? Are our circumstances the same, and what has been their success? The subject has been inquired into in Prussia by Mr. Watson, who states as his deliberate opinion that if the compulsory laws were withdrawn the attendance in the Prussian schools would be every whit as great as it is now. The fact is, that, before the law of compulsion was applied in Prussia, they had had for nearly two centuries a national system of education providing for all. Nearly the whole public feeling of the country was in favour of education, and compulsion was only applied to bring in the small residuum. In Switzerland a similar state of things prevails. But yesterday we were told, by a speaker to whom I listened with very great interest (Mr. Field, President of the Birmingham Chamber of Commerce), of the admirable working of this system in Massachusetts. The fact of which he informed us, namely, that there was a very large attendance—more than 90 per cent.—is undoubtedly true. At Boston there is a very fervent desire in favour of education, and the attendance is large, but I have looked at Mr. Fraser's report, upon the subject of this law of compulsory attendance,

even in a country infinitely more prepared for such a law than we are at the present moment. He says:—"As far as regards enforcing attendance in the schools, the laws of Massachusetts are as precise and peremptory as could be desired, but to no point does the remark of M. De Tocqueville's Pennsylvanian friend more forcibly apply:—'In America the law is powerless when it is not supported by public sentiment.' In spite of legal enactments and penalties, 'absenteeism and truancy' continue to be the great, and indeed the increasing evil of American schools." Mr. Field quoted several times the evidence of Mr. Philbrick; I will also quote from Mr. Philbrick. This is quoted by that gentleman from the report of his agent:—"No fact connected with those schools has impressed me so sadly as the extent of truancy and non-attendance, and the strange apathy of the public as to this fruitful form of juvenile crime. This great evil calls loudly for a remedy. In a few townships the laws in reference to truants and absentees from school are faithfully executed, and with the happiest results; while in others, these laws are overlooked or utterly disregarded. School committees can render no more important service to the public than by combining their own efforts and enlisting the co-operation of their constituents to repress this alarming evil." Mr. Fraser also states the law as it exists in Massachusetts upon the subject of compulsion, and he then adds:—"The law, as will be observed, is emphatic enough, but I believe that its provisions are nearly, if not quite, inoperative. Public sentiment, so omnipotent in America, is not with it; and it stands, therefore, a dead letter upon the statute books." So much with regard to experience in other countries—countries advanced far beyond us in point of education—because this law that you want to apply is limited to boys, 50 per cent. of whom are not at school at the ages under which, by a compulsory law, it would be necessary to have them at school. Would you have them at school from 5 to 13, as in Prussia? Last session Lord Shaftesbury introduced into the House of Lords (and I hope he will introduce it again) a bill which provided that, with certain modifications, the Factories Acts should be extended to agricultural labour, but he felt the difficulty of applying those Acts. He laid down some general broad principle such as that children of a certain age should not have more than a certain amount of labour, and that a certain minimum of education should be given to all, but he proposed to leave it to the quarter sessions in each county to lay down the manner in which that education should be conducted, so as to interfere as little as possible with the labour of the children. The law of Prussia and Massachusetts is, that every child between certain ages shall be at school not half his time, but the whole of his time. ("No, no.") That is the law in Prussia, that is the law in Massachusetts; I do not know what less stringent law you would have. My objection is, not to the principle of compulsion, but I do ask you to pause before you impose upon those who are working with you—who want to make this country so educated that the principle of compulsion shall be adopted, and adopted with the full and hearty consent of the people—not by using the words that the legislature ought "now" to introduce such a measure, to fetter us, and to limit our means of usefulness. Believe me, that those out of Parliament know not the difficulties with which we shall have to contend in carrying simply the rating principle. I know that the great majority of members out of Parliament, or anywhere, if they were asked whether they were opposed to it would probably say they were not, and that if the school was not provided by the voluntary principle, some compulsory means should be adopted. They would admit that readily, but when you came to ask the means they would make difficulties. I appeal to the meeting again not to press upon "willing horses" the adoption of this amendment.

Mr. Dixon, M.P., said—I am quite sure that there is

no one in this room who wishes to interpose any difficulty between Mr. Bruce and the good work which he has in hand; and if I thought that the passing of this amendment would be any obstacle to that good work, I certainly should not be in its favour; but I would submit to that honourable gentleman whether, in reality, it will not considerably strengthen his hands that we should here, not as members of the Legislature, but as outsiders, tell Mr. Bruce what is honestly our opinion upon this matter, and then leave it to the members of the Legislature to make such use as they may think fit of that expression of opinion. We ought to be encouraged greatly to give a unanimous vote in favour of this amendment by the words that have fallen from Mr. Bruce himself, because he tells us, as other members of the late government have told us, that he is in favour of compulsion, and that the only difficulty is as to the manner and the time wherein we shall give effect to it. Mr. Bruce goes on to say that he objects to the amendment in consequence of the word "now;" but, of course, it must be understood that these compulsory laws would form only a portion of a great measure which would take care to provide for all the proper means of education, besides removing every obstacle that stands at present in the way of the children frequenting the schools. All that we ask is that when this great measure is brought into Parliament it will not be considered a complete measure unless it provides the means of education, and takes care that those means are made effective. Mr. Bruce has told us that in Prussia and in America the compulsory laws which are supposed to have done so much good, are, in reality, inoperative, and that the high state of education at which those countries have arrived cannot be considered to be due to those laws. Surely Mr. Bruce must have forgotten that when these compulsory laws were instituted in Prussia, they were passed because the state of education was so defective, or the use of the means that existed was so imperfect, that these laws were necessary, and that, in reality, the present state of education in Prussia is to be taken as a measure of the value of those laws which have produced so wonderful an effect as now to be no longer necessary. In America, it is perfectly true, as Mr. Fraser says, that the law which has been upon the statute-books so long, has been to a certain extent inoperative, because it is not in accordance with the sentiments of the people, but it must be remembered that that law applies to truants and to absentees, and as regards truants it must be applicable. It has now been applied, and, as we were told yesterday by Mr. Field, in one city alone the number of commitments under the Truant Laws amounted to between twenty-five and seventy-five per annum; therefore that portion of the law has been, and is still, effective; and as regards that portion of it which applies to absentees, we must remind Mr. Bruce that, in the native-born Americans, the number of absentees is extremely small, and those who are so are the children of the emigrants into the United States. I do not think we can say, with propriety, that either in Prussia or in the United States, these compulsory laws have not been efficient. What we have to do, I think, is to pass these laws in such a manner as shall not press upon the people too hardly—not to act as if we were angry with them, but out of kindness, in a paternal character; and depend upon it, it is only to a residuum of the whole that these laws will have any force whatever, and to that residuum we can apply no other means.

Sir J. KAY-SHUTTLEWORTH, Bart., said—I should not rise at all to take any part in this discussion if I did not think I could do something towards procuring a unanimous vote upon this question. I have ventured to suggest to Mr. Chester, in private, the insertion of some words which I think would enable Mr. Bruce to agree to this resolution. Speaking generally, I conceive that Mr. Bruce would be desirous, at the earliest practicable period, to procure the attendance of all children for a

reasonable time at school. Upon that subject, I apprehend, there would be no difference of opinion. The point of dissension will be as to the best measures by which that result can be secured, and as to the period within which it can be secured. Now I rather disagree with Professor Rogers as to the statistics which he put before us. If we take the population of this country to be over 21,000,000 at the present time, allowing for increase since the last census, and taking the number of children whom it is desirable should be at school to be as high as the Prussian standard, we should have 3,500,000 children at school. We have, at the present time, schools inspected by the Government for only 1,300,000.

Mr. BRUCE—That is the number the schools will hold.

Sir J. KAY-SHUTTLEWORTH—We have schools built for that number. The number in average attendance in the inspected schools is a million and a quarter, 1,200,000 on a day of examination. I quite agree with the estimate which Mr. Bruce gave that in schools the number of children receiving education worth the name is not above 50 per cent. The number of schools aided could not have more than 1,600,000 children within them. We are asked to pass a resolution with the word "now" in it. "That this meeting is of opinion that the Legislature ought *now* to provide that all children between certain ages, and not only those employed in remunerative labour of a certain character, should receive education during at least a minimum number of hours in each year, security being taken that the education be conducted in efficient schools." Now I think that the last clause of the resolution is an absolute barrier to the carrying out of this resolution now. I therefore suggest that if Mr. Chester would agree, we should insert instead of "now," "as early as practicable." I think that then the resolution would be carried unanimously. We are all of opinion I think, that we ought no longer to dally with this question, but, in my opinion, it is an exceedingly dangerous thing to accustom people to the enacting of laws which you find to be unworkable; it induces throughout the whole country a disrespect for the law, whereas this is a law-loving and a law-obeying country, and there is, in my opinion, nothing so important as that we should show the people that we exercise the most wise caution in carrying through the Legislature laws, but that when they are carried they must and will be enforced by a strong executive. I therefore would urge that whilst I entirely agree in the feeling which Mr. Chester and Professor Rogers have expressed, that it is important that the will of the Legislature and the will of the executive should be directed to bringing the whole of the children of this country to school, and that for a proper period, and to giving them an efficient education, I think we should be very careful as to the words that we employ, for undoubtedly the difficulties in the way of carrying such a law are so great at present as to render it almost impracticable. I would, therefore, suggest that instead of "now" the words "as soon as practicable," should be inserted in the resolution.

Mr. CHESTER—As far as I am concerned I have no objection to that if it meet with acceptance on the other side.

The CHAIRMAN then read the amendment in its altered shape.

Mr. GODWIN, F.R.S., said he was very sorry that Mr. Chester had been induced to consent to the omission of the word "now." It surely could not weaken the efforts of members of Parliament to be able to say, that out of doors a hundred men who had given most attentive and serious consideration to the subject had said that what was proposed in the resolution ought to be done *now*, which meant that it ought to be done as soon as it possibly could be. The objection to the word compulsion seemed to him to be perfectly childish. They had no objection whatever to compel people to keep the law; why therefore should they not compel those who had authority over them, to teach them what those laws were. He sincerely

trusted that Mr. Chester would reconsider his determination, and not agree to withdraw the word "now" from the resolution.

The Rev. W. C. LAKE said, as the proposer of the motion in which this unfortunate word "now" occurs, he wished to say, that he for one entirely consented to its withdrawal; his object would be entirely answered by the substitution of the words suggested by Sir James Shuttleworth. It was a very moderate motion, insisting upon the ultimate necessity of something like compulsion, but for the present he was content with it in a very modified form.

Sir WALTER STIRLING, Bart., said he wished to give his humble support to the very moderate views which had been expressed by Mr. Bruce, and he was firmly convinced that the time had arrived when the question of education ought no longer to be dallied with; at the same time the people of this country were not to be educated at the point of the bayonet. Everybody who had been in Berlin knew that that city was nothing but a barrack for soldiers. The whole government of Prussia was established upon military principles, and what the people were there used to from their earliest infancy would never suit the people of this country. Here, on all occasions, we had free liberty of speech and action, and the people would never endure any educational measure that threatened them with the application of the compulsory principle.

The CHAIRMAN—The resolution, as amended, now becomes a substantive motion, and will read thus, "That while this Conference acknowledges the benefits which have ensued from the Educational clauses of the Factory Act, it is of opinion that the Legislature ought, as soon as practicable, to provide that all children between certain ages, and not only those employed in remunerative labour of a certain character, should receive education during at least a minimum number of hours in each year, security being taken that the education be conducted in efficient schools."

Dr. ELLIS said—The term compulsory education was unpleasant to the people's ears, but he thought another mode might be suggested than that of fines or imprisonment to induce the people to educate their children. In the agricultural districts he had oftentimes inquired why the labourers did not educate their children, and the reply had been, "we should like our children to be taught to read and write, though we cannot do so even to our soldier boys or emigrant girls; but we cannot afford to keep them from working at lace, straw-plaiting, or field labour. The wages of the father alone would not support us and our children." The town inhabitant said, "What's the use of educating? what shall we get by it to make up for what we lose by keeping the children from factory and other works?" The suggestion Dr. Ellis would make, was, he thought, important. If the Legislature rendered it imperative that no public remunerative office could ever be gained without the production of educational certificates of qualification, it would protect the public from the consequences of unqualified officials getting employed, both in the highest posts of responsibility, such as naval ship-building inspectors, the army, the civil service, as well as the onerous though humbler offices of registrars, parish clerks, and even constables. Thus actual coercion, so distasteful, would be avoided, and inducement substituted in its place. The initiative had already been introduced by the Society of Arts, in its system of examinations. Every year the claims for prizes, offered to the successful candidates, gradually increased in number. Attraction was preferable to compulsion. If manufacturers and others were to institute openings for those who could show the best state of preparation for commencing operations in their works, &c., merit would soon be brought into competition, and the means of preparation for the various artistic, mechanical, and mental occupations would be anxiously sought. Men might then be expected to efficiently and honourably sustain their official stations.

Mr. PATERSON said it appeared to him that the resolution before the meeting was an extremely loose one, but he thought they should assist the Legislature by pointing out the difficulties in the way of technical education, and the way in which they should be met. There were a great many questions which ought to be discussed before perfection upon this subject could be arrived at. In fact, before a resolution similar to the one before the meeting was passed, some definite view ought to be arrived at in respect to the kind of education to be provided. The machinery for compulsion had not been stated by any of the speakers, although a certain number of propositions had been made to the effect that compulsion should be resorted to. If he might be allowed to speak of the mode of education in existence, he might say that at the present moment they had not arrived at the commencement of a technical education. They had not the textbooks which should be used in classes if the university plan were adopted; they had not a single library in England where they could find a collection of technical books, or an institution where art could be taught. They were told that such was the apathy of the working classes that compulsory education might become necessary. He would appeal to Professor Huxley why his lectures were so well attended by working men in the evening. He (Mr. Paterson) could state that there was no want of appreciation of technical education on the part of workmen, for when it was offered to them they were always ready to pay for it, and to listen to the instruction with seriousness and attention. He would refer to a fact of great importance with regard to technical education. The Society of Arts, about eighteen years ago, brought into existence a system of exhibitions. He would ask whether that system of exhibitions had grown—was there any systematic action—was there anything to be compared with the action of our universities, with the action of our Royal Academy, by which they should find out who had executed a certain work in order that the honour that attached to that man should be awarded him. As matters stood at present the meeting had, he thought, brought out no new facts or valuable practical suggestions, and, with the exception of the speech of Professor Huxley, he had heard nothing of a practical character from any one. If they wished to discuss general education let them do so, and if they wished to discuss technical education, let them also do so, and let them not talk about fear of Prussia, for they had other reasons why they should wish to develop the great strength of England, besides fear of Prussia. He begged of them, before they committed themselves in the eyes of the public, who were watching them, to arrive at some definite conclusion in respect to their future mode of action.

Mr. CONNOLLY said that perhaps it might not be out of place if he expressed his own views, and what he took to be those of the large class of working men to which he belonged, upon the subject of compulsory education. He believed that the working people of this country would agree to any resolution that would compel their children to be educated. According to his view, no man had a right to make use of the labour of his child to the destruction of that child's mind; therefore it was that he was more in favour of the resolution before it was amended than he was of the amendment, because, although Mr. Bruce might be a great authority upon education, he (Mr. Connolly) was afraid that he was not as great an authority upon agitation; and that gentlemen must know that all agitators invariably asked a great deal more than they ever expected to get. He disagreed with some of the views put forward by Mr. Paterson; they had affirmed general principles, but they had not come there to arrange details. He agreed, however, that in their anxiety to provide for future generations, they were overlooking the present. They took alarm because the educated Prussians marched through the Austrian empire like a bullet through a sheet of card. The nations of Europe became alarmed at that, and every nation looked

at its defences. What did the Government do upon that? They did not start a new rifle, but they converted the Enfield rifle into the best weapon they could. They were now threatened with a greater innovation—the destruction of that commerce upon which they prided themselves, and it was under that fear that they had come there to discuss this question. They had an army of 6,000,000 workers in the field, and why could they not improve them (as they had done their rifles), until the rising generation became educated. He conceived this to be a most important question, and one which ought not to be overlooked. In his opinion all law was compulsion—all law was restraint—and surely no man could find fault with what every man was ready to agree to for the benefit of himself and his children. He had the greatest possible pleasure in supporting the resolution.

The CHAIRMAN stated that Mr. Connolly was one of the men who were sent by the Society of Arts to report on the Paris Exhibition. He had written a very good report upon a particular branch of industry—masonry—a report which did him much credit.

The following resolution, as altered, was then put by the Chairman, and carried:—

That while this Conference acknowledges the benefits which have ensued from the educational clauses of the Factory Acts, it is of opinion that the Legislature ought, as soon as practicable, to provide that all children between certain ages, and not those only who are employed in remunerative labour of a certain character, should receive education during at least a minimum number of hours in each year, security being taken that the education be conducted in efficient schools.

Mr. SAMUELSON, M.P., said—I rise for the purpose of proposing the fourth resolution, which is this:—

That the Council of this Society be requested to appoint a standing committee to take such steps as may give effect to the foregoing resolutions, to support all such well-advised schemes for technical education as may be brought before it, to send such deputations to the Government as may seem expedient, and to re-assemble this Conference when desirable.

Now, I think, that if any body is entitled to take the initiative in this matter, it is the Society of Arts, because it is owing, in a great measure, to the efforts of this Society that education has been advanced. I believe the great step that has been initiated of conducting examinations into the efficiency of evening classes has given a greater impulse to education than almost anything that has been done during the present generation. I think there can be no question whatever that this Society is a body which is well qualified to proceed further in this matter. When I was requested to propose this resolution, I was told that the intention of the Council was that the committee to be appointed should not consist solely of its own members, but that it should include all those gentlemen, both in London and in the provinces, who can bring any light to bear upon this subject. Under these circumstances, I think we may expect that an amount of information, both as to what ought to be done, what are the existing means of effecting the object, and also what further auxiliary measures may be required, will be elicited by this committee, which will be of the utmost value. I have already given notice that I shall move for a Select Committee of the House of Commons to inquire into this subject; but at the same time a committee here will be of the greatest value, and will accelerate the operations of the other committee if it should be appointed. Under these circumstances, I move that a committee be appointed in the terms of this resolution.

The Rev. HENRY SOLLY said—I have much pleasure in seconding this resolution. I must say one word in reference to what was just glanced at by Mr. Paterson, namely, that one of the most important things that can be pressed upon the attention of the committee which is proposed to be formed here is that they should remember the enormous power which is exercised by the parent in this matter which we have under discussion. I was speaking to a gentleman who is well known as an earnest pro-

moter of education, and I asked him to take it up in reference especially to adults. He said he was so busy with the children that he could not do that. He further said, "It is my opinion that unless we educate the parents we shall never educate the children. I am quite satisfied that whatever value there may be in compulsion—and I believe there is a great deal—we must have it if we cannot attain our object without it, but it is infinitely better that we should enlist the sympathies of the parents upon our side, and get what we require to be done through their co-operation than that we should get it in spite of their resistance. I believe that this Society in establishing local examinations has advanced a very great step in this direction. I have lately noticed the valuable results produced by parents coming to witness the distribution of prizes to their children, and it is my opinion that if you follow that up, by getting the holders of prizes and those who have distinguished themselves, good situations, you will very much assist in the good work of education. If we stop where we are, I think we shall be making a very great mistake. What we have to do is to induce the parents of the children to value education for its own sake, and for its effect upon the whole character of the individual.

The resolution was then put and carried.

The Right Hon. H. A. BRUCE, M.P., said—Before we part, allow me to move that a cordial vote of thanks be given to Mr. Hawes for his conduct in the chair. We have gone over a very large region of discussion, and it has been impossible to confine every speaker within the narrow limits of any one particular subject. Complaints have been made that this meeting has not been sufficiently suggestive in respect to details, but it has set many minds working, and I have no doubt whatever that the result will be most beneficial. Perhaps we shall some day be called together to consider the practical details. I am sure you will unanimously accord your thanks to the Chairman for his able conduct in a position which was sometimes one of considerable difficulty.

Mr. Alderman SALOMONS, M.P., said—I have much pleasure in seconding the motion. Nothing can be more useful to the public than this meeting, and it would be impossible to have a better or more courteous chairman.

The motion was carried by acclamation, and the CHAIRMAN having acknowledged the compliment paid to him, the meeting separated.

CANTOR LECTURES.

The second lecture of Dr. Letheby's course "On Food" was delivered on Monday evening, the 27th inst. A full report of these lectures will be given in the *Journal* during the vacation.

EIGHTH ORDINARY MEETING.

Wednesday, January 29th, 1868; Sir CHARLES NICHOLSON, Bart., in the chair.

The following candidates were proposed for election as members of the Society:—

Allen, J. H., 2, East India-avenue, E.C.
Clarke, David, Mayor of Macclesfield.
Clarke, George W., North Cheshire Chamber of Agriculture, Macclesfield.
Davenport, George, 45, Ludgate-hill, E.C.
Fitzwilliam, W. S., 28, Ovington-square, S.W.
Gourley, E. T., Mayor of Sunderland.
Van Abbott, G., 5, Princes-street, Cavendish-square, W.

The following candidates were balloted for, and duly elected members of the Society:—

Bell, Arthur George, 4, York-st., Covent-garden, W.C.
 Boyle, Edwin, 10, John-street, Adelphi, W.C.
 Dalziel, Alexander, Cardiff.
 Davis, Valentine, Furnace-house, Carmarthen.
 De Lavigerie, Alfred D., 11, Sussex-street, Warwick-square, S.W.
 Holland, Edward, M.P., Dumbleton, Evesham, and Union Club, S.W.
 Hooper, Frank, 24, Russell-street, Covent-garden, W.C.
 Klein, Julius, Ph.D., 176, New North-road, and 3, Wilton-square, N.
 Limbert, Edward Harvey, 5, Hercules-terrace, Upper Holloway, N.
 Marr, James, 19, Bessborough-gardens, S.
 Mort, William, 155, Fenchurch-street, E.C.
 Pilling, Jonas, Manchester and Liverpool District Bank, Stafford.
 Reveley, H. J., Bryn-y-gwin, Dolgelly, North Wales.
 Richardson, J., 13, Savile-street, Hull.
 Round, Edwin, Tudor Works, Sheffield.
 Rudkin, Thomas, 17, Newgate-street, E.C.
 Smith, John, 22, Russell-street, Covent-garden, W.C.
 Tappen, G. C. W., Horley-villa, Horley, Surrey.
 Venables, Benjamin, 253, Camden-road, N.W.
 White, J. Ludford, 111, St. George's-road, S.W.

The Paper read was—

ON THE CLIMATE AND INDUSTRIAL PROSPECTS OF THE COLONY OF NATAL.

By DR. MANN, SUPERINTENDENT OF EDUCATION AND SPECIAL COMMISSIONER OF THE COLONY.

On the south-eastern edge of the great African Continent, 800 miles beyond its southern promontory, and half as far from the southern tropic; looking to the expanse of the sunny Indian ocean, and wooing the soft sea breeze that is still, in those latitudes, almost a trade wind, there lies a small land, which in the year 1497 was at once *terra incognita* and *terra natalis*, the newly-sighted shore of the Portuguese adventurers, who were opening out the ocean route to India; which in 1820 was a desolate and depopulated wilderness, held by the alligator, the sea cow, the lion, the panther, the buffalo, and the elephant; which in 1838 was the seat of a colony of Dutch Boers, who could not live upon less than 8,000 acres of land per man; which in 1850 was a British colony and a "land of samples;" but which in 1868 presents the very remarkable spectacle of sugar, coffee, arrow-root, tobacco, maize, cotton, the pine-apple, the banana, and the orange, growing almost side by side with wheat, turnip, and the beet-root, and almost under the gaze of cattle, sheep, and horses; all these most valuable productions being comprised within the limits of a territory that has not a larger extent than one-third the area of that portion of our own island which is south of the Tweed.

It is my purpose on this occasion briefly to explain to the Society, which "encourages Arts, Manufactures, and Commerce," why it is that this young colony of Natal, so recently a desolate wilderness, has rapidly become a land of bright hope and of high promise; why it is that the South African "Land of the Nativity" of the old Portuguese, of Zulu Kafir savagery, and of Dutch Boer-dom, now confidently claims for itself recognition and welcome at the Society of Arts, and looks to have a place henceforth accorded it in the records and regards of this venerable and distinguished patron of social movement.

In carrying out this purpose I must of necessity begin with that which underlies the effects that have to be spoken of, namely, the natural conditions which bring about one of the most remarkable climates in the world. Let it be conceived that, in some suitable spot, a large conservatory is established, where a high temperature can be maintained throughout the greater part of the year, where mechanical contrivances are provided for regular periodic waterings, rendered most copious at the

season when they are most needed, and lighter when they are least required; where an elaborate system of blinds is furnished for the period of most scorching sunshine, and where the blinds are withdrawn, and free exposure to sunshine secured, when the sun is least vigorous; and in this conception there is pretty much the sketch of what nature herself has done for at least one large portion of the region that is the theme of this communication.

In the first place, in relation to the high temperature of this natural conservatory, this is obviously provided for by the general situation in which it is established on the earth. The central portions of the colony are within 400 miles of those parallels of latitude where the sun shines down vertically upon the ground; this necessarily secures a great heating power during a considerable portion of the year. But the sunshine of Natal has been also in some measure supplemented by a hot-water apparatus. The in-shore sea-current of the Indian Ocean, on this part of the African coast, sets steadily down from the lower latitudes of the tropics and brings with it some of the superfluous warmth of those regions. It has not yet been determined on a scientific base how much the coast climate of Natal is indebted to this ocean influence. My own impression is, that the influence tells in a negative, rather than in a positive way; that the warm sea-current protects the coast lands from occasional chills, rather than actually raises their degree of warmth. The mean temperature of the six hottest months of the year, 50 miles inland, and at an elevation of 2000 feet, where my own researches have been chiefly made, is 69 degrees. The mean temperature of the coolest month in this summer series is that of October, namely, 66·6°; the mean temperature of February, the hottest month, is 71·8°; the mean temperature of the coast range itself, near the level of the sea, is about four degrees and a half above this; the air temperature in the shade very rarely indeed rises above 85°, unless upon chance occasions when a hot land-wind, or sirocco, is blowing in force; upon those occasions it mounts for a short interval some degrees higher; the highest temperature registered by my instruments on these exceptional occasions was 97·6 degrees.

There is quite enough in these figures to indicate that the heating power is very considerable. It is great enough, indeed, to convert the land at this season into a scorched desert, if there were no counterbalancing agency in play. That the land is not such a scorched desert is due to the additional fact, already glanced at, that nature has made her own arrangements for watering as well as heating. The heat is tempered by cloud-screens, and softened and vitalised by rain, poured down at frequent and convenient intervals. The precise physical conditions by which this periodic watering is secured, have then next to be indicated.

The general surface of the country is one broad slope, stretching down from the edge of the great central table-land of the continent to the sea. It is, so to speak, the bevelled rim of the continental table, looking out to the Indian Ocean, and towards the south-east; a rim from 120 to 160 miles broad. Now when the nearly tropical sunshine falls through the day on this land-slope, the air gets so far warmed that it acquires a tendency to rise along the slope. In other words, it is driven in and up by the superior pressure of the cool sea-air; and in this way a strong and steady sea-breeze is established. This, too, is a power superadded to another that is already at work in the same direction accomplishing the same end. In the parallels of Natal there is a general tendency of the air to move from the south-east during the period of summer under the great trade wind influence. From the combined operation of these two causes, it is found that during the course of one year the wind is blowing 820 times from the sea, for 145 times that it is blowing off the land. A sea wind is, of course, a moist wind, in the sense that it comes in to the land laden with as large a load of moist

vapour as it is able to sustain under the circumstances. If it blows in upon yet colder land, it at once deposits some considerable portion of its moisture; but if it blows in upon warmer land, as in the case of Natal, it acquires increased powers of sustaining its invisible burden. Nature has therefore had, in this instance, to adopt a still further expedient to complete its watering provision.

As the day advances the landslope gets more and more hot under the strong sunshine, and the upward movement of the air becomes proportionally more and more energetic, until at last it is converted into an actual upcast, like the upcast of a strongly-heated chimney. A large volume of the heated air is then rapidly and suddenly transferred to elevated regions of the atmosphere. As it mounts it expands, under the relief from superincumbent pressure, and as it expands it becomes rare and cold, and for both reasons is unable longer to sustain its full watery load, which is therefore in part precipitated to the earth with manifestations of concomitant electrical disturbance. A thunderstorm is developed, and heavy rain falls.

The operation of the agency which has been here described is so constant and steady that in any one place rain falls on almost every second day, on the average, during the six months of greatest heat. Most probably it falls somewhere every day. But it is the nature of these thunderstorm disturbances to confine themselves to a certain range, and to burst now here and now there. Nature's waterpot, like that of the skilful gardener, is swept from place to place until the soil is moistened and refreshed everywhere. About 24 inches of rain are thus scattered on the ground in Natal at an elevation of 2,000 feet above the sea, during the six months of summer. At this season anything like drought is entirely unknown, and the rivers are always full. From October to March an average fall of four inches per month, and the occurrence of rain on 15 days in every month, may be looked for.

The actual distribution all over these months, for an average of eight years, is:—

For October	3.60 inches.
„ November	4.58 „
„ December	5.04 „
„ January	3.92 „
„ February	4.41 „
„ March	3.29 „

It will be readily imagined what the immediate consequence of this combination of abundant and never-failing watering with high temperature must be, so far as vegetation is concerned. All vegetable growth is stimulated into most energetic activity. The coast and lower regions are clothed with tangles of luxuriant evergreens, and during the summer the land is verdant from the sands of the sea to the summits of the mountains. But it must be added that this abundance of rain, during the hot season, performs another most beneficent and essential service for this favoured colony. It tempers and softens the heat almost every afternoon. Very soon after the mid-day period the cloud-screen is drawn between the sky and the earth, and kept extended over the land until the sun has plunged beneath the horizon. And, as soon as the cloud-screen is withdrawn, vigorous evaporation from the saturated earth carries on the tempering and cooling work. This, in reality, is why it is that a land, lying mainly within the 30th parallel of latitude, boasts a yearly mean temperature of 64.71 degs. at an elevation of 2,000 feet, and of little more than 69 degs. at the sea-level. The heat is, so to speak, transmuted into vegetable energy, instead of being inflicted as free and accumulative caloric upon the land. In this approximately tropical country there are not more than fifty days in the year in which the temperature rises, at the city of Maritzburg, to 84 degs., and not more than twelve days on which it rises to 90 degs. There are only about eight nights in the year on which the temperature does not fall to 70 degs., and

there are 200 nights in the year in which it falls to 60 degs.

It is somewhat to be regretted that time does not allow this analysis of the climate of Natal to be pursued on this occasion through the opposite half, or winter season of the year, when nature's chief aim seems to be to encourage and use sunshine, and to elevate the temperature. All that it is possible here to say is, that the same natural agency is carried on, but in a much less energetic degree. The landslope is warmed, the moist sea-breeze maintained, and in the late afternoon cumulus clouds are heaped together over the higher hills and mountains; but the atmospheric upcasts are not established, and the thunderstorms not fully developed. The rainfall at 2,000 feet of elevation, for the six months intervening between April and September, is six inches, in the place of twenty-four. During each of the two mid-winter months only one-fourth of an inch of rain may be looked for, and rain may be expected to fall on only three days. In the months of April, May, August, and September rain may be expected to fall on eight days, and nearly one inch and a-half may be looked for. The exact rain-fall for these months, taken from the mean of eight years at an elevation of 2,000 feet, is as follows:—

April	1.44 inches.
May	0.95 „
June	0.26 „
July	0.23 „
August	1.14 „
September	1.32 „

The months of May, June, July, and August are periods of almost unbroken genial sunshine. The mid-winter June of Natal very nearly indeed resembles an exceptionally fine mid-summer June in England, excepting that the longer nights, of 14 hours' duration, are fresh and cool. The mean temperature of this season is 60° at a height of 2,000 feet, and nearly 65° on the coast. The temperature commonly rises above 70° each day. There are only eight days in the year on which the temperature does not rise to 60°, and scarcely 20 nights in the year in which it falls below 40°. The self-registering thermometer only marked a freezing temperature, at a height of 2,000 feet, five times in a period of eight years, and the greatest cold recorded in that period was 29°.

During the mid-winter season the grass gets coarse and dry, and the face of the country would be russet and brown, were it not that it is made black instead by the prevalent custom of burning the dry herbage. The rivers and water-courses, however, never dry up. There is always enough mist on the hills, in addition to the lessened rainfall, to secure this result, and make all but the smallest streams perennial. Deciduous trees, like the white mulberry, are not more than six weeks bare of leaves. The gardens are kept full of bright flowers all winter long, and food crops can be reared, even in these months, by the judicious practice of irrigation. Indeed, crops that require dry harvesting, like wheat, thrive best when grown under this management in winter.

Sufficient reason has been given, in the preceding statement, for the presence of sugar, coffee, arrowroot, the banana, the pine-apple, and the orange in the plantations of Natal. The approximately tropical position of the colony, and the provision made by nature for abundant and frequent rainfall during the season of greatest heat, amply explain the successful cultivation of those productions. But it yet remains to show how it is that wheat, the root-crops of temperate climates, and cattle, sheep, and oxen are also at home in a land which is thus suitable for tropical produce. The key to this seeming anomaly is found in the physical configuration of the country.

It has been already intimated that the colony of Natal is, properly, merely the bevelled or sloping rim of the great table-land of the African Continent. This table-land is, in the main, reared more than 6,000 feet above

the sea. At the north-western frontier of Natal, this table-land dips by a sudden precipitous fall, or step, of a few hundred feet, and so forms a kind of land-ward bulwork for the colony. From the lower grounds of the colony it is not possible to perceive that this is merely a ledge, or the perpendicular face of a step. It looks like a true mountain ledge, and is distinguished by the name of the Drakenberg mountains. On the north-west the frontier of the colony is a jagged and precipitous mountain bulwark; on the south-east it is the sea. A strip of country, about 150 miles long, and varying from 130 to 160 miles broad, between the edge of the high African table-land and the Indian Ocean, is thus the territory of Natal.

From a salient point in the southern stretch of the mountain frontier, there issues a great spur, which crosses the entire midland region of the colony, from side to side, and forms there a central upland, or hill region, which, for the greater part of its course, has scarcely an inferior elevation to the Drakenberg mountains themselves. The high road from the port to the interior crosses this central upland at a height of 5,400 feet, 70 miles from the sea, and the hills which surround the pass rise several hundred feet above the road. Seaward, this central mountain region subsides to the coast by parallel but somewhat sinuous fingers, or ridges, that have distinct water-channels or river-courses lying between them. But in the opposite direction it dips into a broad depression or basin of large extent, which is drained by a single river system, and which will again claim attention, for a specific reason, presently. As, therefore, the traveller leaves the port, to make his way into the interior of the colony, he begins to climb, and his climb is so sharp that he is more than one mile high when he is seventy miles on his journey. Here, then, is the explanation of the sheep, the horses, the cattle, and the temperate productions of the colony. The influence of rise above sea-level in lessening temperature, is too familiar a phenomenon to need special exposition here. Everyone knows that all the lofty mountains of the earth are capped with eternal snow. The sugar, the coffee, and the luxuriant evergreen vegetation in Natal are confined to a breadth of some sixteen miles of land bordering the sea. In advancing inland, at a distance of about 16 miles from the shore, and at an elevation of 800 feet, the bananas, the pine-apple, the sugar-cane, and the luxuriant tropical vegetation disappear, and hills covered with rich open pasture, or occasionally clad with a thinly-scattered bush of the thorny *mimosa*, take their place. It has been seen that at Maritzburg, which is 2,000 feet high, and something more than 40 miles in a direct line from the sea, the mean annual temperature is 64 and a-half degrees, instead of 69. Further inland and upland the mean temperature, of course, falls still more. In a letter printed in the *Field* newspaper, of the 26th of December last, an old colonist, who has been long settled on the higher slopes of the great central hill region, thus writes of the climate experienced there:—"The climate here is most agreeable and bracing. In the winter we have occasional snow-storms, and I have once or twice seen the snow more than a foot deep. We have frost almost every night for three months, more or less. Even during the summer the heat is seldom, if ever, oppressive. I have never known a hot night; and during a period of ten years I have never been more than twenty nights without a fire in the grate of an evening."

The midland districts that lie about the city of Maritzburg are very agreeable, and are well adapted to the general purposes of mixed farming. But the most valuable grazing grounds are found still further inland, and at yet higher elevations. The general range of the country in these higher regions is open and unsheltered pasture. The forests of the country are confined to the coast, and to the sides and tops of the higher mountains, where a considerable abundance of large trees of the genera *Oreodaphne*, *Pterocaryon*, *Podocarpus*, *Olea*, and of other valuable timber-yielding evergreens are found.

In now passing on from causes to effects, and glancing at the industrial prospects of this very remarkable land, so far as time and present circumstances allow, it may be necessary to premise that the task of speaking of the industry of a young land is always a delicate, and, in some degree, a difficult one. The country is so thinly occupied, and the results attained by settlers are yet in so experimental and early a stage, that it is not easy to strike an altogether safe balance between conflicting statements. There is yet no statistical science to fall back upon; and personal testimony is of no use, because it may be collected to prove just anything you please. It relates quite as much to the qualities, tempers, temperaments, abilities, and defects of men, as to the character and capabilities of the country. One man will tell you that his lambs will not skip; another that they all have weak legs; and another that they all die; while another man will state that he has no trouble with his sheep, that he scarcely ever loses an animal; that his sheep are highly remunerative; and that his lambs dance all day long. And so with each other branch of industry or pursuit. Perhaps the surest ground to take a first stand-point upon in dealing with this theme, is furnished by a series of facts which are patent to every one, and which can admit of no misconception. Twenty years ago there was not a blade of sugar-cane in Natal, nor a single plant of coffee. The yearly export of sugar from the colony is, at the present time, nearly 6,000 tons. Several hundred acres are planted with coffee; hundreds of thousands of fresh plants are being put in the ground every year, and the oldest plantations are yielding 800 lbs. of berry per acre. Fourteen years ago there was scarcely a sheep in the colony; there are now considerably more than 200,000 sheep upon the hills; and the annual value of the export of wool, partly derived from the plains beyond the mountains, is £71,000 sterling. Horses are now being shipped as military remounts for India; and, after a period of fatal lung-sickness, the cattle of the colony are again multiplying by thousands yearly on the upland pastures.

Sugar was first experimentally grown in Natal in the year 1849. There are at the present time 10,000 acres under cane, and over 60 mills in operation, crushing the cane and manufacturing sugar. There seems to be no doubt that sugar can be as well grown in Natal as in the West Indies, or the Mauritius, provided the planter has the requisite capital and skill. Much of the soil is eminently suited for its production. The cane is occasionally touched with frost on low-lying plains, which seems to be more due to moisture than to actual cold, for the canes on the hill sides are not so affected. Many of the early planters in Natal have come to grief, not from any unfitness of either ground or climate, but because they have borrowed the capital with which they have carried on their work, at extravagant rates of interest. The best authorities I have spoken with, all seem to agree that careful, clever men may borrow a capital at £12 per cent., and grow sugar in Natal remuneratively and successfully; but that they must not expect the same success if they undertake to pay £20 or £25 per cent. for their capital. No doubt it must be a really able and capable man who can ensure success with even £12 per cent. to pay for capital.

Coffee is perhaps now the favourite object of industry upon the coast. It was first planted experimentally near Durban, twelve years ago; young plantations are now to be encountered everywhere, and there are a few fine plantations already in full yielding. The quality of the produce is very fine, and the average yield large. The Mocha variety thrives to perfection. The one thing which has militated, more than anything else, against the rapid extension of coffee plantations, is the unwelcome fact, that for four years the planter has to meet outlay without return; in other words, that he must have considerable capital to invest in his work. Some men of small means are, however, now gradually making their

way into coffee, by clearing and planting small plots only, each year, and making a return at the same time from the cultivation of other common crops, such as Indian corn, tobacco, and oat forage. The coffee is chiefly planted on the slopes of the sea-hills, where there is suitable soil and exposure, and where the primeval bush is cleared away to make room for the plantation, artificial shelter being provided for the young plants by establishing rows of orange trees at convenient distances. It is estimated, by competent authorities, that 500,000 acres of land in Natal, at least, are suited for the growth of coffee, but, in all probability, it will be yet found that it is possible to extend the plantations much further inland than was at first conceived, and that in this way another 500,000 acres will become available. It is confidently anticipated, that one day the entire so-called coast region of Natal will be one vast stretch of almost uninterrupted coffee plantation.

The tea-plant thrives in the same region of Natal as coffee. It grows and flowers readily and vigorously, but whether it will ever be found worth while to plant it largely for commercial purposes remains yet to be determined. Up to the present the experiment has been confined to a few hundred plants.

Arrowroot was one of the first exports from Natal. It was a great favourite with the early colonists, on account of requiring but little capital, and care rather than high skill, for its growth and preparation; and also because it flourishes in soil not equal to the support of tropical produce of greater delicacy and value. The great abundance and purity of the running water in the colony also have proved eminently favourable to its manufacture. Farina, of the value of nearly £6,000 sterling, is still occasionally exported from the colony in a single year. The chief consideration that keeps its production within narrow limits, is the uncertainty of the English market, and the readiness with which this becomes over-stocked.

Cotton has been grown again and again in the colony, but for various reasons has not yet firmly established itself among the accepted staples; at the same time the further statement must be made that it has not yet been cast aside. In the first place it requires for the collection of the fibre labour that is at once abundant, cheap, and certain. There is cheap labour in Natal, but it is of an uncertain character. It must also be added that nearly all the early experiments on its growth were made near the coast, and that there it proves to be very open to the ravages of insects, and inclines to lengthen out and fritter away its period of flowering, so that the harvest becomes tedious and difficult to deal with. Within the last few months it has been grown much more successfully in higher ground; in one instance, at between 2,000 and 3,000 feet of elevation. In this position the coolness of the night in the winter season seems to apply just the corrective that is required for the evil habit of desultory flowering. The value of the export for the last three years for which there are returns was respectively £2,646, £3,984, and £4,699.

Nothing has yet been done with silk, excepting in the form of small experiments. But the white mulberry plant is now at home everywhere in the colony, being very generally used for garden fences; and it grows with surpassing ease and luxuriance. It is indeed almost impossible to prevent fragments of the tree from vegetating. The general promise for silk in Natal is so great and obvious, that after a careful consideration of the entire bearing of the question, a gentleman, who has been long used to the management of the worm in China, has just sailed to give it an exhaustive trial in Natal, having made arrangements for the direct introduction of an adequate supply of the best Japanese seed. The only enemies that this gentleman at all fears are predatory insect life and thunder-storms, both of which he believes may be circumvented by judicious management. My own opinion is that silk under fair management will succeed. If it fails it will be due to some vexatious and trivial

difficulty that it is not within the sphere of forethought to anticipate, and that only experience can discover, and not to any, at present, ascertained condition of climate or circumstance.

Tobacco will certainly some day be an export from Natal. It is already grown extensively, and of unexceptionable quality; and no other difficulty appears to attend its production excepting that it requires a good soil and skilful preparation. It would appear even now among the colonial exports, but for the fact that there is a very large demand for it within the colony. It flourishes both in the coast district and in the uplands. One of its cultivators, writing from the coast, within twenty miles of the port, says, "Tobacco is doing so well for me that I feel constantly an ever present dread that it must shortly fall off. I continue to find a sale for all I can make, that is about 320 lbs. a week, and it pays me a good profit. Besides cavendish, which I manufacture, I sell about 100 lbs. per week of the leaf." A second successful cultivator carries on his operations 80 miles above Maritzburg, and 130 miles inland from the coast.

The sheep of Natal at the present time constitute a very important part of its quadrupedal interests. They have, of course, no place amidst the plantations and pineapples of the coast. But they have certainly already managed to establish themselves on the hills. Before the year 1855 the woolly fleece was not seen in Natal pastures. The only sheep known was a brown hairy creature, belonging to the natives, a variety of the Siberian goat, or Mouflon, of no value excepting for its mutton. In the year 1855 the Dutch farmers suffered so severely from the occurrence of epidemic lung disease among their herds, that the bright, and, as it has proved, fortunate, idea occurred to them of endeavouring to have a second string to their bow, and they accordingly brought down flocks from the old colony to mingle with their herds. There is scarcely a farmer in the uplands now who is not more or less a flock-master. Some of these complain of frequent losses and deficient profits; others are loud and constant in their reports of prosperity and success. The real truth of the matter seems to be that sheep only do well in Natal at a tolerably high elevation, but that elevation of the land is not the only thing that is required. There must also be good drainage, good unretentive subsoil, and suitable grass. The rocks of Natal, like those pretty well of all the South African continent, are tumbled about in a perfect chaos of confusion. Hence the precise mineral and physical characters of the subsoil vary exceedingly within very limited range. But in addition to this, on account of the peculiarity of climate, which has been already dwelt upon, the natural grass is so luxuriant during one portion of the year that it is capable of feeding many sheep to the acre; while during another and more limited portion it is so dry and coarse that it takes many acres properly to feed one sheep. The inference is obvious, that sheep farming in Natal will ultimately consist of the rearing of comparatively small flocks in connection with general tillage of the soil, as is done in England, rather than in the possession of unlimited flocks roaming wild over the prairie. There is now no doubt that where this system is pursued, artificial food provided, and due skill and care exercised in the selection of the farm, and in the management of the stock, sheep will prove a most marked and important element in the Natal settler's prosperity.

There are certain farms in the uplands of Natal where horses are bred in considerable numbers, and with marked success. They are liable to fatal epidemic disease on the low-lying lands of the coast. An export trade is at the present time in process of establishment with India, where the Natal horses are in great favour as cavalry remounts and chargers. The Natal horse is a descendant of the Cape breed. He is plain about the head; but, as a rule, hardy, courageous, gentle, and full of endurance. The horses in military service readily carry 17 stone 35

miles a day, upon an allowance of 10 pounds of Indian corn and what can be picked up from the open pasture. In one instance, in the year 1865, a company of the Cape Mounted Rifles, on service in Natal, marched 90 miles in 25 hours—seven hours through a heavy thunderstorm—with only one halt, each horse carrying 17 stone, and there was not a case of either sickness or injury, the horses all coming on parade the following day quite fresh.

The cattle of South Africa have so long been an institution and a power, as well as a name, that, fortunately, it is not necessary to say much about them. Natal in this particular more than equally shares the good fortune of its neighbours. The luxuriant grass of the Natal pastures is eminently adapted for the creation of beef. The old colonist, whose letter has already been alluded to, bears a very emphatic and noteworthy testimony upon this point. He says:—"This country"—24 miles from Maritzburg, and 5,000 feet high—"is eminently healthy for sheep, horses, and cattle. A draught ox, worked a dozen years in the yoke, and nothing but skin and bone, turned out in our pastures for a summer's run, shall, in the autumn, be sent to the butcher's as fat and heavy as any stall-fed ox at home; and, what is more, he shall not cost his owner one shilling in the process. He is simply turned out to grass, and let alone till the day he is driven to market." The only drawback to the feeding and rearing of cattle is that they are now liable, as in England, to occasional visitations of the epidemic lung disease.

It is not possible upon this occasion to say much that might otherwise be told of various food crops that are reared from the Natal soil. The Indian corn is the grand food staple of the colony, and grows everywhere in the utmost luxuriance. It is indeed a most valuable grain, being literally good alike for man and beast. Wheat grows readily in the uplands. It is somewhat liable to rust when harvested in the hot summer, but may be easily and certainly ripened in the sunny winter by the practice of irrigation. On account of this difficulty of season, enough is not yet cultivated for the home supply of the colony; but there is no doubt that some day, as agricultural hands multiply, it will form a large export. Oats and barley grow even more readily than wheat. The former constitutes the principal forage of the country. The turnip makes a very good appearance on the hills. The beetroot is entirely at home; and on some of the rich bottoms of the upland valleys swells into almost Broddignagian proportions. In one instance recently reported by Mr. Shepstone, the Secretary for Native Affairs, some Silesian sugar beetroots, belonging to a gentleman named Landsberg, in unmanured ground, but under winter irrigation, produced at the rate of not less than 170 tons per acre.

There is still one other important feature that I must present to notice before I can be said to have fairly placed before the Society the "industrial prospects" of the young colony of Natal. It will be remembered that allusion has already been made to a broad basin drained by a single watershed, lying northwards, or beyond the great central elevation of the colony. Now for a considerable time it has been known that there are large deposits of coal in this basin. The rivers cut through coal in certain places, and in others fine seams, three or four feet thick, are seen running into the faces of the hills. The waggon-drivers fill sacks as they pass along the roads, and carry them to the towns for the use of the blacksmiths. Now it has been thoroughly ascertained that there are very large quantities of this coal; it has been traced through a wide extent of country. It is also certain that for some purposes it is of very excellent quality. The blacksmiths use it continually in preference to anything else they can get. It burns well on the domestic hearth. It yields a brilliant and pure gas. The only practical question that has not yet been decided regarding it is—whether it is really good coal for the purposes of steam machinery. No sufficiently large trial has yet been made of it to determine

this point. The simple reason for this is, that the locality where the coal has been hitherto chiefly procured is 130 miles away from the city, and 180 miles away from the port. Now, transport of a heavy material, in a land circumstanced like Natal, for one hundred and eighty miles, means a payment of something like ten shillings per hundred weight! The Government has now made arrangements, nevertheless, to bring down some twenty tons of the coal, and have it fairly tested on board the Government steam tug and the mail steamers; and a careful geological survey of the district will most probably be carried on simultaneously with such trial. Traces of carboniferous deposits are found in other more easily accessible parts of the colony. Among them, in two or three places on the coast, within a few miles of the port. In all these instances, however, the find is more of the nature of a carboniferous slate than of a true coal. Very thin seams of coal are enclosed in thicker layers of earthy matter, and the whole may be made to give out considerable heat under a strong blast, but does not burn freely and readily. The fact seems simply to be that there is a good *a priori* case for the anticipation that the upland coal will be found to be honestly allied to the valuable upper coal measures of England, and that the broad basin of a single watershed is a coal basin in the proper and technical sense of the term, but that it is equally probable that the coast deposits are allied to the older and lower carboniferous slates, which are useless commercially and economically. As a general rule, in South-eastern Africa the older rocks are prominently developed along the coast, and sandstones of younger geological age are found inland. But this rule, in the present instance, can by no means be entirely relied upon. Throughout South Africa the foundation rocks of the earth have been so rolled and tumbled about that there is no certainty anything geological may not be found anywhere. Granite and gneiss and old silurian sandstones form the shore-rocks along the coast of the newly-annexed county of Alfred, once known as Nomansland. But, at the extreme limit of this region, between the boundary river, the Umtamfume, and the next stream the Umzumbe, and also a short distance within the Umtamfume, there occurs along the shore a limestone deposit filled with organic remains of comparatively modern age. At low water the surface of the wave-worn rock may be seen to be sculptured in relief with these remains, and the caves hollowed in the sea cliff have them also embossed in their walls and ceilings. Among these remains the most abundant and characteristic forms are a giant muscle, or pinna, three feet long, ammonites, terebrice, trigonice, and a very beautiful spiral shell, apparently allied to the chemnitzia. The formation is obviously of the age of the oolite, or perhaps even of the more recent chalk formation of Europe. No one, therefore, can yet undertake to say that fragments of the upper coal measures cannot be found in the coast district of Natal.

In the meantime it is obvious that the work immediately under the hand of the colonists is to see what they can do with the coal which is, rather than to enter upon what may prove a wild goose chase after the coal that may be. The country lying between the port and the coal-field is difficult, on account of the steepness of the gradient, and the presence of the great central highlands; but it certainly is not inaccessible. What the colony needs is a cheap railway, of the nature of the lines that carry slates in a similar country, from the quarries, to Port Madoc in North Wales, made and worked with great economy, and purposely limiting its rate of transport to something like twelve miles an hour. A railway of this character from the port to the city, if made by the government itself from its own resources, without outlay for promotion and other collateral expenditure, would not entail a yearly cost upon the community of more than some £8,000, even if it yielded no revenue. But it is not possible to doubt that the revenue

between the port and the city would, even at the present time, exceed this estimate. If railways of this character can be carried into Natal, they will extend themselves, and the coal will soon be reached through their own inherent vitality. But their primary and most immediate function will obviously be to open out the country, and to create their own traffic and profit. Expensive systems of railway, with fast traffic, could not for some long time to come be carried out and supported by this young colonial community; but cheap and slow railways, of single line and narrow gauge, constructed and worked with the most rigid economy, could be made even now, and extended, too, from year to year. The immediate growth of the prosperity of this interesting colony, indeed, more depends upon the accomplishment of this object than upon anything besides. The attention of the colonial government is, at the present time, well fixed upon this consideration, and the lines of country most available for railway traffic are being carefully examined and surveyed.

It is matter of old and familiar knowledge that there is a fine land-locked harbour at Natal, readily accessible to vessels of moderate burden, but inaccessible to larger ships, on account of the presence of a sand-bar across its outlet. A considerable outlay has already been made to improve the accessibility of this fine natural harbour by engineering works. But difficulties have been encountered which were not at first anticipated, and modifications of the original plans of work have had to be made. A railway has been carried from the works to a stone quarry within easy reach, and it is expected that within a couple of years a permanent opening and deepening of the outlet of the channel will have been effected. Vessels in the inner Bay of Natal lie in smooth water, protected from the sea by a splendid range of hills, 300 feet high, and terminating in a fine sea-bluff.

In conclusion, it must be stated that in addition to a fine and varied climate, good soil, and a convenient physical configuration, abundant rain, deposits of coal, and a useful natural harbour, Natal has yet one other advantage, that could not be left altogether without allusion, even in this brief sketch;—it has a numerous native population, to a large extent available for cheap labour. There are at the present time only 17,000 white colonists in Natal, yet there are nearly 200,000 blacks, or Zulu-Kafirs. These people live in a rude way, under native chiefs, who are amenable to the magistrates and the Government. They are, in the main, a gentle and orderly race, although as yet, for the most part, barbarous, and pay taxes to the Government, for the protection and advantages that they receive. They are not essentially warlike. The martial development of the Zulu era was a mere accident in their history—the impress of the life of one energetic and ambitious chief upon the tribes around. They do not take readily to hard work, but many thousands of them now engage themselves in daily toil, under the resistless inducement of English silver and gold; and more will continually do so as artificial wants are created by their contact with civilisation. These Kafirs are properly not negroes, but a mingling of negro organization with some higher type, most probably derived from the Highlands of Abyssinia. They are superior to the pure negro, both in character and capability. They can be trained into excellent mechanics; they make excellent herdsmen and ploughmen. Some of them are acquiring property of their own, and taking to civilized life in upright, square houses of European form. I know one man among them, named Nembulo, who has purchased a steam sugar mill for himself, and who works his own machinery.

Although there is this abundant reserve of cheap native labour to draw upon, it must be understood that it is not entirely available for colonial enterprise, nor as constant and reliable as is to be desired. Those Kafirs who do engage in work, work fitfully and uncertainly, and for limited periods, and many will not work at all. They do not yet feel that dire necessity which says

ruthlessly to the labouring class in older communities, "labour or starvation." A very few days or weeks of work gives to the Kafir enough means to live in what to him is luxurious idleness for the rest of the year. On account of this unreliability of the Kafir, where steady and laborious operations have to be carried on, some 6,000 Indian coolies have been imported, under contracts for fixed terms of service, on the plantations; still, allowing to the utmost for this unquestionable drawback, there yet remains the underlying truth that there is, in the colony of Natal, a very great deal of very cheap, and at the same time valuable, native labour, which every employer may draw upon to a larger or less extent, according to his own tact and management. People who have been servants all their lives in England, at once employ native servants of their own in Natal. Artisans not uncommonly have Kafir attendants to carry and even to lift their tools for them. Many planters and farmers complain, and no doubt truthfully, that they cannot find labourers. On the other hand, there is at the present time in England one of the oldest and most successful of the sugar planters of Natal (Mr. Lewis Reynolds, by name), who states distinctly and unreservedly that he has at the present time 200 Kafir labourers employed upon his plantation; that he could double the number if he required to do so; that he has never had occasion to employ anything but native Kafir labour; and that, during fourteen years' experience, he had never, even for a passing occasion, been in want of a man.

It is a noteworthy fact, requiring a passing word of explanation, that a land possessing the virtues and attractions which have been here described has, nevertheless, only 17,000 European inhabitants, after 24 years of British occupation. The explanation is simply this. In the early period of its colonial history its land was given away to almost any applicant in large sweeps, and much of the land thus distributed was acquired at almost nominal prices by those who purchased it as a speculation, and who now hold it for sale at prices which it cannot yet realize. At a somewhat more recent date, the Imperial Government of Great Britain, ascertaining what the result of the first land grants in the colony had been, suspended all further grants; and so, during eight years, no land has been given away, and the most powerful inducement to immigration and settlement during that time has been kept in complete abeyance. It is now, however, among the industrial prospects of Natal that this has been changed. The Colonial Government has recently completed a well-considered arrangement with the Emigration Commissioners of the Imperial Government, which has for its base the granting of assisted passages and allotments of crown land to well-selected men who have some little means to begin with, and special training for agricultural and pastoral pursuits. In carrying out this plan of immigration and land-settlement, the colonial government is showing itself scrupulously, and even sensitively, anxious to introduce only men who are fairly sure to succeed, and to give every possible assistance and countenance to such men. In short, it aims at a slow, gradual, and organised, rather than hasty, promiscuous, and haphazard introduction of settlers. The operation of such a plan of careful selection must necessarily be gradual and slow; but there is every probability that it will be sure, and that as many good and capable men will now be attracted to Natal by these inducements, as will suffice to utilise the great natural advantages of the region, and to quicken and establish the commercial prosperity of the colony.

DISCUSSION.

Mr. GILLESPIE (who was announced by Dr. Mann as having just returned from Natal, and as being one of the oldest merchants there) said—having been appealed to by Dr. Mann, he might say he endorsed all that had been

said by that gentleman with regard to the climate and other physical features of this colony, which had been so well described in the paper. He had resided in Natal for eighteen years, and, with regard to the temperature, the highest he ever saw was 96 degs. of heat in the shade, and the lowest was about 35 degs. On an average the temperature in winter was 55 to 60 degs., and in summer, 75 to 80 degs. Of the up-country he knew very little, but he was able to state that the cultivation of sugar was now being carried on to an extent that would enable the colonists shortly to become exporters of that article instead of importers. Coffee was also largely cultivated, and the produce was superior to any that had been imported into the colony. Arrow-root was also taking a high place among the productions. The cost of the sugar was from £9 per ton to £12 per ton, considerably less than formerly. At the Cape, the Natal sugar fetched as high a price as that of Mauritius. Formerly the Cape would not take the Natal sugar because they said it was full of bees, which arose from the accidental circumstance of a large swarm of bees having on one occasion got into one of the sugar mills, and they were smothered in the sugar. Dr. Mann was mistaken in stating that coffee had been exported from Natal. This had only been done in sample, because the colony had yet a good deal to do before it could furnish its own supplies of that article. A large field was opened for its cultivation, and he had no doubt in a few years it would be exported. He was happy to bear his testimony to the general character of the climate, and he ventured to refer to himself as a pretty fair specimen of health after an eighteen years' residence there. He had had only one day's illness. Dr. Mann had scarcely done full justice, he thought, to the present state of Kafir labour. That gentleman left the country two years ago, and during that period a great change had taken place for the better. What had been stated with regard to the natives not staying long in one service was true, but he had never heard complaints of the want of continuous labour. Owing to the present scarcity of money, a great many Kafirs might not be able to obtain work, because there were so many coolies at hand, but he thought a person requiring a large amount of Kafir labour would have no difficulty in getting it, the wages being from 7s. to 10s. per month, and about the latter sum for food—making, on an average, £1 per month for wages and food. The Kafirs, he said, were very good labourers if they were well looked after. A great trait in the Kafir character was their extraordinary honesty. Anyone wanting to send money, on telling the Kafir what it was, might be certain of its safe delivery at its destination; and he knew of instances in which personal injuries had been received in defending property which they had in their charge. Unfortunately, civilization, in this case, as in others, brought some evils in its train, and the most dishonest among the Kafirs were those who were the most civilised. With reference to sheep rearing, especially, it was remarkable that one man was highly successful, while another followed that occupation at a loss; he could, however, only attribute the difference in the results to the want of that practical ability by which success could alone be secured.

Mr. RYDE said, from all he had heard of this colony from relatives who had gone out there, the great want was labour, and it was that want which kept Natal in its present comparatively stagnant condition. If English agricultural labourers were sent out there, before many months they found they could become farmers on their own account, and could make more profitable use of their time than employing it for the benefit of the capitalists by whom they had been sent out. The Duke of Buccleuch sent out 40 labourers and their families from the New Forest, in Hampshire, to Richmond, and before they had been there two years the whole of them had become Natal farmers, and most of them were now well-to-do people. In speaking of the healthy character of this colony, no mention had been made of the water.

He had been informed that, although the water was plentiful, there was something in it which was not altogether conducive to health; and on so important a subject as that he should be glad to have a little information from Dr. Mann. He would also be glad to hear that gentleman's opinion as to the feasibility of making a railway from the Cape to Natal; he thought that was what was wanted to promote the success of Natal. He was afraid the harbour works were at a standstill just now. He would be glad to know which bank Dr. Mann would recommend people who were going to this colony to send their money to; and he would also be glad to be informed what was about the price of land in this colony at the present time.

Mr. G. J. SYMONS remarked that to an observer in these matters, the picture that had been presented to them of this portion of the African continent was an agreeable contrast to the old descriptions of that country, in which it was spoken of as a sandy desert, unproductive, with scarcely any traces of water. The more that continent was opened out by exploration the more those descriptions were falsified. With regard to the temperature of Natal, according to Mr. Gillespie, the maximum heat was, on an average, 96°; Dr. Mann gave it at 97°, which was a temperature not higher than was frequently experienced in England during the summer months. He presumed the higher temperature obtained at the higher altitude of the country.

Dr. MANN said, as a rule the higher temperature was at the higher elevation.

Mr. SYMONS said that was what he should have expected, partly in consequence of the diminished atmospheric pressure, and partly because the humidity of the air in the high regions would be less, and the amount of radiation greater. It was a remarkable meteorological fact, that in a country lying within 20° of the equator, they had a temperature which was not very much higher than in England. In the paper before them they had a very full, clear, and useful synopsis, not only of the climate, but also of the natural productions of one of our colonies. He had no personal interest in any of them, further than related to their meteorological conditions; but he would say there was at the present time a great demand for information of a thoroughly reliable character as to the climates of different colonies, as also of their products. There were but few means of comparing Natal with the Cape in these respects. He thought in a country like England, it was desirable there should be some central place where the records and observations of the meteorological conditions, &c., of our various colonies sent to the Colonial Department of the Government, could be consulted by those who contemplated emigration to, or opening commercial speculations with, one or other of them; and he thought the Council of this Society, in originating, if possible, something in the way of a series of reports on the climates of our different colonies, would be doing valuable service.

Mr. P. L. SIMMONDS, while bearing testimony to the importance and interest of the paper by Dr. Mann, quite agreed with the last speaker in the want of some central accessible depository for information on the climate and resources of the several British colonies, where all published works, maps, statistics, &c., could be referred to. Great ignorance as to the geography, meteorology, revenue, ratio of wages, &c., in our colonies, prevailed, not only in this country, but especially on the Continent. While officially engaged last year at the Paris Exhibition, he had been continually applied to by different learned societies, journalists, and individuals of all classes, for recent statistical details as to the meteorology, population, and production of wool, gold, cotton, and other staples in the colonies. Recent maps and atlases from the colonies were especially sought after. Many years ago, when the colonies had not attained to that wealth, importance of production, and extent of population which they now presented, they had in London their Colonial Society, Colonial Club, *Colonial Gazette*,

and *Colonial Magazine*. Now, when all these were more essentially necessary, there was no general organ of publicity for the colonies. The Society of Arts did what it could by inviting papers on colonial topics and opening the columns of its *Journal* for discussion, but the sphere of the operations of the Society embraced a wide range of other subjects, which had to be dealt with from time to time, and hence full justice could scarcely be done to colonial interests. Passing from this subject to the colony which had occupied their attention this evening, he might state that it was one in which he had always felt great interest, and in which he had many friends. Even in the four or five years which had elapsed since the paper on Natal, by Mr. Robinson,* had been brought under the notice of the Society, the colony had made great progress, looking at its limited European population. Its sugar production was remarkable, and at all the International Exhibitions, in London, in 1862; in Dublin, in 1865; and in Paris, 1867, Natal had made a most creditable display of its varied resources, and received due honours from the several juries.

Mr. MACKENZIE apprehended that one purpose of the present paper was to make known to the public the great advantages which Natal possessed for the emigration of the surplus population of this country. With regard to the remarks which had been made as to inducing the English labourer to go to our colonies, he entreated those who took an interest in that subject not to restrict their attention to those persons who possessed small means of their own. At present there were not sufficient inducements to the agricultural labourer who had not £10 or £20 in his pocket to emigrate to our colonies. As regarded some of those colonies, the restrictions that were imposed made it impossible for the class of labour which would be most valuable to emigrate to them, because it was required that persons should have £5, £10, or £15 in their possession, or else that they should pay part, at least, of their passage-money, while America imposed no such restrictions, which he believed had been the cause of drawing so many of our English and Irish population to that country. He had no doubt our colonies would have enjoyed the advantages of the great tide of labour which had been poured into America if we had held out the same advantages as that country had persistently done. He submitted it was desirable to hold forth the most liberal inducements for emigration to our colonies, even if it were done by a self-imposed tax by the colonists themselves, to furnish means for bringing in several hundreds of our labouring population every year. He went entirely with those who thought the introduction of the railway system was essential to the progress of a colony like that under consideration. He did not mean an expensive railway, at a cost of £25,000 a mile, but a mere tramway, of a light description, narrow gauge, and single line, as a means of intercommunication at low speed between the highland and the coast, both for passengers and produce. His opinion was that until a railway afforded a means of inter-communication, the prosperity of this colony would not be commensurate with the great natural advantages it possessed; and he believed if the colonists could obtain a government guarantee upon English capital for that railway, for every pound that was so expended there would be a return tenfold. Mr. Mackenzie then averted to the desirability of establishing in the City of London a Colonial Hall of Commerce, where gentlemen could meet together for the interchange of opinions and information relative to all our colonies, and as a rendezvous for those colonists who occasionally visited this country. An endeavour, he said, was made some time ago to establish such an institution for the colonies of British North America, but it did not meet with sufficient support, partly, he believed, because it was restricted to those particular colonies.

Mr. W. C. SARGEANT (Crown Agent for the Colonies) said he fully endorsed what had been said by Dr. Mann

with regard to the Kafir character, as also what had fallen from his old friend Mr. Gillespie on the same subject, and it was with a feeling—if not of surprise, yet akin to it—that he had heard this confirmation of the opinion he had always entertained with regard to the Kafir as a labourer; because, when he left Natal, in 1857—and, in the life of a young colony, ten years was a long epoch—he recollected the unfavourable manner in which his opinion was received, that the Kafir labour would be found very valuable to the European colonist. One gentleman had asked about the water, and assumed that there was something the matter with it. He (Mr. Sargeant) had travelled in Natal a great deal, and he always drank the water from the natural streams without experiencing any ill-effects upon his health. With regard to another question, viz., to what bank in the colony people would send their money, he could only say, in his official capacity, that if anyone went to him, he should be willing to give him all the information on that subject which his experience of the colony enabled him to do.

The CHAIRMAN, in closing the discussion, said he had listened, as all present must have done, with great interest to the paper. There were, however, one or two points on which he should have been glad if Dr. Mann had been a little more explicit. All who knew anything about colonization were aware that the great want was labour. It appeared there was a certain amount of indigenous labour to be obtained, of that inferior character which was furnished by a semi-barbarous people, but still useful to a certain extent; but, notwithstanding this, there was a great demand for European labour. He should be glad to hear the rate of wages which were paid for European labour, because in the Australian colonies, where meat was so cheap that a leg of mutton might be bought for a shilling, ordinary mechanics were paid 10s. or 12s. per day for their work. Then with regard to the land regulations, he should like to know the price of the land, and the terms on which it was obtained. In Canada and the American and Australian colonies there was a competition between the administrations of the different colonies who should furnish land on the best and cheapest terms. He was satisfied, unless they organised a good system for the acquisition of land in these colonies, they would never induce emigration to them to any great extent. With regard to railways, he knew the general opinion was in their favour in our colonies; yet, in almost every instance, railway enterprise in these regions had been a failure. Look at Canada, with its three millions of population; look at Victoria, exporting ten millions of gold annually; there the railways, excepting in the larger centres of population, did not pay, whilst those in New South Wales barely paid the working expenses. They had expended three or four millions of money, and the colonial government had encumbered itself with a debt which it would take years to pay off. He was afraid, if the development of this colony was to depend upon the establishment of railways, it would be long postponed; but he did not think it was dependent upon that, nor, apart from the other industries within it, did he look for much results as a sheep-rearing and wool-producing colony. With regard to the present stock of sheep—calculated at 200,000—there were individuals in Australia who themselves possessed more than that number. Neither the climate nor the physical features of Natal appeared to him to be adapted to extensive or successful sheep farming, experience having shown that, instead of flourishing best in wet and mountainous countries, low, flat, dry plains were most congenial to sheep. There was one species of industry which he thought was promising, viz., the cultivation of tea. It had been successfully cultivated in various parts of India, and it was a sort of labour which might be supposed to be not distasteful to natives. He never heard of these great colonial dependencies without feeling deep anxiety and regret that the capabilities of these magnificent regions were not more

generally known and appreciated in this country, because there was in them every material for furnishing happy homes, prosperous lives, and the means of subsistence to countless numbers of our fellow-creatures. It was evident that the growth of population in England was greater than the means of their support, and emigration appeared to be the only present resource for the relief of much of the agitation and political excitement by which the country was now disturbed; those people now struggling with want, and pining in a state of discontent, might be transferred to those beautiful regions which are the property of the British nation, where they would have the means of being useful to themselves and to the generations which followed them. He quite agreed that it was worth an exertion on the part of the colonies to furnish the means of free emigration to that class of labour which they most stood in need of. The Australian colonies had spent millions in providing free passages to their emigrants; and if their friends in Natal spent a few hundreds a year in that way, it would, in his opinion, be more profitable to them than railways, and would better develop the resources of the country. He would conclude by proposing a vote of thanks to Dr. Mann for his admirable paper.

The vote of thanks having been passed,

Dr. MANN, in acknowledging the compliment, said so many topics had been touched upon in the discussion, that he could only refer to the more important of them. With regard to the water of Natal, in his personal experience no country could have finer water as a general rule than was there met with. The fact of rain falling every other day showed that there could not be much stagnant water, which would be injurious to health. He believed what had been alluded to was that in some districts worms were produced by the use of stagnant water; but that was very exceptional. With regard to metalliferous deposits, he might state that some veins of copper ore had been discovered, and he had no doubt it existed in considerable abundance. With respect to the present price of land in the colony, it was regulated by what was called a government "up-set" of £4 per acre for the upland; on the coast it would command a higher price. The public revenue of the colony was, at the present time, about £140,000 a-year. It had been considerably above that, but the reduction of the revenue was due to the stoppage of imports, owing to the merchants having traded considerably beyond the immediate requirements of the colony; consequently the public revenue had fallen off. The reason why more had not been done by the colonists hitherto in the way of importing European labour, was the want of the necessary funds for the purpose; but he was happy to inform the chairman and the meeting generally, that the sum of £5,000 had been placed by him, on behalf of the colony, in the hands of the Emigration Commissioners for sending out that class of labour which was most wanted there. He (Dr. Mann) came to the conclusion that the only way of dealing with the case was, for the colony to provide a floating capital of £20,000 or £30,000, to be employed in sending out selected labourers and their families, furnishing the passage money and the necessary requirements for twelve months after their arrival, the advances by the State to be repaid by instalments. In that way it was hoped slowly but surely to supply the want to which reference had been made. The wages of mechanics generally were from 7s. to 10s. per day, and, for the most part, they had full work. The artisans drank pale ale at 18s. per dozen; many of them had two Kafir servants to carry their tools; and some rode on horseback to and from their day's work. He had himself paid £420 for building a small library at his own house. The cost of living for artisans in Natal, for the ordinary necessities, was somewhat less than in this country, meat being from 4d. to 7d. per pound, and flour was a little cheaper than in England. Luxuries were somewhat dearer. Reverting to the question of the sale of

land, Dr. Mann added that it might be bought under the Government regulations in freehold allotments of 200 acres, and 400 acres more were reserved for four years, which might be purchased during that period, at five shillings per acre; smaller allotments were disposed of to persons of more limited means. With regard to railways in this colony, he agreed in the main with what had fallen from the Chairman; at the same time an expensive class of railway was not contemplated. He had gone into the matter with practical engineers, and he had sent out plans for a railway to be made at the cost of about £2,000 per mile, for a speed not over twelve miles an hour, which would answer the purposes of the colony. With regard to tea, the cultivation of it had been commenced in several different parts of the colony, and he had no doubt the anticipations of the Chairman in that direction would, before very long, be realised.

SULPHUR AND ITS REFINING.

By CHARLES N. ELLIS, F.C.S.

Sulphur mines abound nearly all throughout Sicily, but, as the Sicilians have neither roads nor railways, those only are worked situate in the neighbourhood of a port, that is, in a radius of 40 miles, because the transport comes too dear. The transport is generally carried on with donkeys or mules as far as a high road, and then by small carts, which hold from 10 to 14 cwt., or direct to the port, the carriage of which costs from 1-8 tari per cantaro of 175 rottoli (= 1-75 cantaro ordinary).

Sulphur mines are generally situated in the hills, being found and worked in the crudest manner possible. If, from indications of sulphurous water or other appearance, a man supposes there is sulphur, he begins to dig a hole. If he is successful in his search and finds sulphur, well and good; if not, he gives it up. Should he be successful, he hires a capomaestro (*i.e.*, a master who has apprentices under him, or young workmen), a sort of small contractor, with some five or seven lads, who dig out the hole, and the boys carry away the thrown-out material in small baskets on their shoulders (containing from 30 to 40lbs.). The ore is dug out, and when a sufficient quantity is thus obtained a ring of stone is first built, from 20 to 50 feet in diameter and ten feet high, with a slanting floor. This is then filled up with a very high cone with ore. It is then thatched with earth outside. This is termed a "calcarone." It is then set fire to at the top and burns downwards. When it has burnt for about a fortnight they then tap it at the bottom, and let the sulphur run out into forms made of wood—rinsed out with water (the water answering like buttering a pie dish, &c.), and you can turn it out when cold without sticking to the mould—called "battate," of about one to two hundredweight each.

There are, of course, large mines, where seventy to one hundred capimaestri are employed with their boys.

If water is met with, a drain is either built under the mine (which is very expensive), or it is pumped out with drums, which is very inadequate, consequently most mines with water are given up.

Some mines there are with steam pumps, which have seldom done well, for the following reasons:—

1st. The English drivers were drunken fellows.

2nd. The proprietors would not sink shafts.

3rd. If there is the least thing wrong in the machinery, repairs cannot be done on the spot. If sent for repairs to ———, much delay is caused by the dilatoriness of the foundry officials, and when the things do arrive they do not fit. They have then, at last, to send to England, consequently nearly a year's time is lost.

But most of the mines are worked by people without means, who, of course, cannot afford to buy machinery, and, what is very extraordinary is, that the richest mines contain water. This water does not appear to rise from

wells, springs, &c., but is chiefly caused by the heavy penetrating rains of winter.

It is but rarely that mines can be bought, as nearly all the land belongs to nobles, who reside in Palermo, and who let their mines at the rate of from 15 to 45 per cent. of the produce.

Thus, as things are carried on, it requires but little capital; but, with a good capital, I am convinced a very good business would be done, so as to net not 10 to 20 per cent. on the outlay, but a good deal more.

Let us suppose a man with a capital of £100 takes a mine, and engages some *capi-maestri* with their boys; he pays them, perhaps, once a month, or more seldom, and according to the number of "casse" of ore they have worked out; he then at once sells sulphur for delivery, either at once, one month, three, six, nine, or twelve months, and receives perhaps one-third, half, or the whole price, but of course suffers heavily, for the merchants won't lay out their money for nothing. The sulphur is then deliverable at the port, where there are stores which receive it, where the carriage is advanced, for which he pays again from 2 to 2½ per cent. in sulphur.

This is a brief sketch of how the Sicilians carry on sulphur mining. As a profitable investment I should recommend boring to ascertain where the greatest quantity of ore was to be found—if a mine not already in work be obtained. A company with a capital of £20,000, with part paid up (or private firms for their own consumption in England, with overplus for sale), would be amply sufficient, at all events for a commencement. The great thing would be to have pumps that do not easily get out of order. There should be a blacksmith's forge, with a fitter, a man who thoroughly understands the working of pumps, and could do all repairs when out of order, and a general manager who has a good general practical knowledge. Steam engines of 10-horse power, or even less, where the work cannot be done by mules, I should think would be the best. The engines should be of such a kind that they can be easily transported and put together; no part should weigh more than 3½ cwt. or thereabouts, as perhaps they would have to be transported to their destination on the backs of mules, depending entirely upon the situation of the mine; these things managed, all the rest is easy.

There are hundreds of mines ready for work, and there would certainly be a good dividend the end of the first year. Here I should observe (Girgenti) that the mining goes on all the year round, but the burning only from the beginning of June, when the harvest in the neighbourhood is over, to the end of October, when the sowing season commences, else one has to pay damages. A mine with water would be let at from 15 to 25 per cent. for a number of years. "Calcarone" are generally made of from 200 to 600 "casse" of ore, and a "casse" weighs (more or less) about six tons, and produces from 12 cwt. to 16 cwt. of sulphur; the fusion of such a *calcarone* lasts about two months.

There are, of course, preliminary expenses, such as finding veins, building *calcarone*, making of passages or sinking shafts, engines, coal, &c. For other charges the following may be taken.

Say a mine, producing 25,000 cantari (175lbs. per cantaro)—about 1,154 tons, at 13 cantari to the ton, would require for administration as follows:—

1 Administrator, paid at the rate per ann. . .	£75
1 Capo maestro (species of mining engineer) . .	40
1 Accountant	40
2 Measurers, each £30 to £35	65
1 Policeman	25

Total£245

The miners with their boys are paid according to the situation or richness of the mine, at the rate of 45 to 60

tari per casse (or even less, a taro = 4d.), but this includes all charges, as follows:—

Administration	£240
2,500 casse of ore at 50 tari	2,083
I assume for general expenses, such as finding, building <i>calcarone</i> , &c.	500
	£2,823

From 25,000 cantari* deduct 25 per cent. for proprietor; this would leave 18,750 cantari, or worth 9 tari per cantaro; at the mines for best seconds, about 18 tari.

But, of course, one must make allowances for many other expenses, and for accidents, such as part of the mine falling in, &c., calculations differing at every mine, as also the qualities. There are, however, a mine or two which might be got close to the sea-side, which would produce 50,000 cantari of best seconds, where the sulphur could be embarked without charges, and might be got by good parties for 22 per cent. for nine or eighteen years, and no damage could be done in the neighbourhood. No doubt they would require pumps, but in other respects they are in working order. I have been informed that close to Girgenti there is a coal-mine, or rather a mine of schist, containing a kind of tar (it smells like petroleum), which might be made useful, with knowledge and means; it is not worked, and is close by a sulphur mine, which has water, and might be had cheap.

DEARNESS OF BREAD IN FRANCE.

In consequence of the scarcity and consequent dearth of wheat in France, the Government has decreed that the protective duty, established by the law of 1861, against wheat imported in foreign bottoms, shall cease until further notice; wheat brought into France by foreign vessels will therefore now only pay the same duty as if introduced in French vessels, namely, 50 centimes the quintal, with the additional war-tax of 10 per cent. on the amount.

The authorities of Paris have put in action a special enactment relative to the price of bread. In 1863 the bakers' trade was thrown open, and the price of bread left to be regulated by the cost of flour, and by competition only; a certain portion of the import duties on corn and flour was set apart to form a fund, entitled the *Caisse des Boulangers*, the object of which was to meet the case which has just occurred. This *caisse* has now been called into service, to keep down the price of bread to 50 centimes the kilogramme for fine wheaten bread, and 42 centimes for seconds. Those bakers who accept the arrangement are to exhibit these prices in their shops, and to receive from the fund in question the difference between those prices and the present actual price of bread. A very large number of bakers, 680, have accepted the proposal in question, but many still hold out, objecting to the terms on which the calculation is made. The compensation is calculated in the following manner:—To the cost of a metrical quintal of flour in Paris is added 9 fr. for the expenses of conversion into bread, and the number is divided by 130, for the number of kilogrammes of bread produced, and of course a register is kept at each baker's, showing the quantity of flour employed and bread produced.

Of course such averages must give rise to considerable question; and consequently the agricultural press is filled with counter estimates and objections. Amongst the calculations and estimates which have a general interest, the following may be selected. An experiment in co-operative bread-making was made recently, by order of the Maire of St. Omer, and under the direction of the managers of certain charitable institutions. The result was as follows:—

* Produce at least of 2,500 casse, at 10 cwt. per casse, at 18 tari per cantaro, leaves a handsome profit of 100 per cent. under market price.

	Frs.	cents.
100 kilogrammes (220lbs. English)		
of seconds flour cost	54	50
Leaven (or yeast)	1	12½
Fuel	1	25
Labour	1	50
Hire of oven	1	0
Total	59	37½

The quantity of bread produced was 136 kilogrammes, and the cost was consequently just below 43½ centimes per kilogramme.

The *Echo d'Agriculture*, taking the bakers' side of the question, makes the following calculation:—

	Frans.
The average cost of flour of first quality is,	
per 157 kilogrammes	90
Octroi duty	2
Cost of making it into bread	14

This brings the cost of the 2 kilogramme loaf (4½ lbs.) up to 1 fr. 6c. the kilogramme, while it is sold at 1 franc. As in London, the bakers of Paris are compelled to weigh all bread, except the fancy kinds, when required to do so, and the poorer class, as a rule, demand it; but the bread delivered at the houses of the consumers is generally considerably under weight; the gain in the latter case, and the profit on fancy bread, have therefore to be set against the asserted loss in the former case.

Another authority on such matters, the *Bulletin de l'Agriculture*, protests against the estimate of the former journal, as exaggerating the cost and diminishing the amount of bread produced.

The policy of the whole arrangement respecting the regulation of the price of bread is a subject of serious contention. On the one hand it is regarded as a happy method of obtaining a reserve during times of plenty, upon which to fall back in times of scarcity, the fund in question being the result of the whole or part of the octroi duties levied on wheat and flour in Paris, these duties being one centime per kilogramme in the former, and 1½ centime on the latter.

It is objected, on the other hand, that the abolition of these octroi duties would be a far greater boon than the application of the *caisse* once in four years (this is the first time since the new law was passed that a demand has been made on the *caisse*, which contains a large sum); that if such an arrangement be good, it should come into force before bread has arrived at such a high price as 10d. the 4 lb. loaf; and that if the system be sound, it should be applied not only in Paris, but all over the country.

Lastly, in order to record as many facts as possible, it is important to state that the application of the law in question has already had the effect of raising the price of flour one franc per sack.

Fine Arts.

GREAT ART EXHIBITION AT BERLIN.—A grand exhibition, which means, we presume, an international exhibition of art, is announced to take place in Berlin in the months of September and October, in the present year; the management is in the hands of the Royal Academy of the Beaux Arts, and full particulars are promised shortly.

Manufactures.

NEW EXTRACT OF Madder.—The chemical committee of the Society of Mulhouse has awarded a medal of the first-class to M. Pernod, of Avignon, for the introduction into the print-works of a new madder dye. M. Schaeffer, the reporter of the committee, says that he

has made many trials of the extract in question, and that it is a paste containing ten per cent. of dry matter, its dyeing power being four times that of the preparation called *fleur de Garance*. Mixed in fitting proportions with alum and iron mordants, it produces, after steaming, washing, and soaping, dark reds of rich and brilliant hues, and unusually beautiful violets.

Commerce.

PRODUCTION OF TOBACCO IN BAVARIA.—The following table, compiled from a return recently published by the Agricultural Society of Bavaria, shows the extent of land planted with tobacco in each of the six provinces of Bavaria in which this description of crop was grown in the year 1866, the total quantity of tobacco produced in each province, and the average price at which the crop was sold:—

Provinces.	Land planted with Tobacco.	Total produce (leaves in the dry state).	Average price per English cwt. of dried leaf.
	English acres.	Eng. cwt.	s. d.
Palatinate.....	10,323½	115,742	14 9
Upper Pfalz	10½	185	15 1
Upper Franconia..	5½	35½	12 4
Central Franconia	1,613½	16,400	11 10
Lower Franconia..	105½	1,202	21 2
Swabia	2	28½	7 10
Total	12,060	132,593	—

The aggregate extent of land planted with tobacco in 1866 was somewhat less than in the previous year, and in proportion to the ground cultivated the total produce was also rather less. The yield per acre of the crop of 1866 varied, as usual, very considerably in different districts of the same province. In the Palatinate, the most productive land yielded at the rate of 14½ cwt. of tobacco (when in the dry state) per acre; the poorest land only 3½ cwt.; whilst in Central Franconia the yield per acre varied from 10 to 2½ cwt., and in Lower Franconia from 11 to 3½ cwt.

SILK TRADE BETWEEN FRANCE AND ITALY.—The following are the exports and imports of silk between France and Italy during the five months from 1st June to 31st October of the past year:—

Exports from Italy to France.

	Quantity. kils.	Value. frs.
Grains (eggs)....	1,300	100,750
Cocoons	99,000	2,047,320
Raw silk.....	136,300	12,575,250
Thrown silk	700,300	66,528,500
Floss silk	611,200	11,338,400

Total francs 92,590,220

Exports from France to Italy.

	Quantity. kils.	Value. frs.
Foulards.....	17,718	1,346,568
Plain stuffs.....	88,685	12,149,845
Damask stuffs ..	5,875	863,625
Mixed stuffs	25,919	2,177,196
Tulle	7,168	896,000
Fringes with gold	1,739	513,005
Fringes of silk ..	2,141	289,035
Fringes mixed		
with silk	12,459	872,130
Ribbons	13,147	1,485,611

Total francs 20,593,015

IMPORTS OF ORANGES TO FRANCE.—The importation of oranges, citrons, lemons, &c., into France from Spain and Italy has increased since 1830 fivefold, when 5,943,022 kilos., to the value of 2,791,511frs. (£111,660), were imported; in 1866 the imports of these fruits amounted to 25,923,700 kilos., to the value of 7,413,840 frs. (£29,673). The port of Marseilles figures for the greater part of this trade. The following are the amounts received at this port for every tenth year, beginning in 1836:—1836, 2,217,589 kilos.; 1846, 7,133,758 kilos.; 1856, 9,214,537 kilos.; 1866, 9,592,120 kilos. The exports of oranges, &c., from Algeria to France have increased considerably since 1836, during which year only 8,100 kilos. of fruit from this colony were landed at Marseilles. In 1856, 350,537 kilos. were received, and in 1866 upwards of 962,694 kilos. In a good season upwards of a million of kilos. of oranges, as in 1864, have been sent from Algeria to Marseilles.

Notes.

PRIZES OFFERED BY THE SOCIÉTÉ D'ENCOURAGEMENT OF PARIS.—A grand medal, value one thousand francs, for the application of the fine arts to industrial purposes. A prize of five thousand francs for the employment of boracic acid and borax. Prizes of the value of one thousand francs each for the following subjects:—Water power motor for small workshops; gas jet regulator; a new application of any abundant mineral substance; the disinfection and clarification of sewage water; the application of endosmose of liquids; the application of the endosmose of gases; heating and ventilation of rooms; preservation of food; improved method of making vinegar from wines; and a memoir on the state of industrial art as shown at the late Universal Exhibition in Paris. A detailed programme is to be had by application to the Secretary of the Society, 44, Rue Bonaparte, Paris, and all models, plans, and documents are to be sent in on or before the first day of March.

SHOEING HORSES.—The Imperial Society of Agriculture of France has just awarded its gold medal to M. Charlier, veterinary surgeon of Paris, for his new system of shoeing horses, which has recently attracted much attention, and which has been described in the columns of the *Journal*. The shoe is a narrow rim of iron or steel let into a groove, about three-eighths of an inch in width and depth, cut round the edge of the hoof, thus leaving the whole of the frog and centre of the hoof free and capable of natural expansion. These shoes have been partially adopted in the French cavalry.

PUBLIC VEHICLES IN PARIS.—The number of public vehicles now in the streets of Paris is given as follows:—Common cabs, 2,967; *remise*, or superior cabs, 3,533; *grande remise*, or carriages for hire by the day, week, or month, 2,000; omnibuses, 678; omnibuses belonging to the railway companies, 140; vans (licensed), 800; omnibuses running to the suburbs of the city, 230; total, 10,348. During the time of the Exhibition there were three thousand more vehicles in the city; the vans alone at one moment amounted to 2,300. Of the cabs common and *remise*, 2,793 belong to a company, and 3,707 to private masters, who number in Paris nearly a thousand; of these, six hundred probably are possessed only of the one cab which they drive themselves. The largest private establishment does not possess more than sixty or seventy cabs. In 1853 there were not more than 1,580 ordinary cabs, 2,400 *remises*, 600 superior carriages for hire, and 340 omnibuses. In 1864, before the business was thrown open, the cab company had between 2,400 and 2,600 vehicles, and private owners 2,043 *remise*, and only 64 ordinary cabs. Since the change in the law, the numbers, it will be seen, have

increased to the extent of 1,800. In order to be able to drive a cab, or any other public vehicle, it is necessary to be provided with a certificate from the Prefecture of Police; the number of drivers at present inscribed on the police list is 25,000. During the last twenty years the system of charges for public vehicles has been changed half-a-dozen times. The tariff at present in operation does not give satisfaction; and it is said that the plan of charging according to the distance passed over, which has been for a considerable time under consideration, will be adopted very shortly.

LIGHTHOUSES ON THE ITALIAN COAST.—The lighthouses on the coasts of Italy have of late received the special attention of the Government. The sum of 1,750,000 francs (£70,000) has been expended in the construction of new lighthouses. Previous to the year 1860 the Italian lighthouses, not including those belonging to the Venetian and Roman States, were fifty-eight in number. Since then thirty have been constructed and eight are now building.

COAL IN ITALY.—In spite of the assertions to the contrary of many geologists, it now is fully proved that Italy possesses many deposits of coal and excellent lignite, some of which are at present explored with most satisfactory results. Among these may be mentioned the mines of Borgotaro, situated in the valley of the river Taro, in Parma. The quality of coal obtained from these mines is excellent. From experiments that have lately been made at the Milan gas works with Borgotaro coal, 24 cubic metres of gas per quintal of coal were obtained (847·60 cubic feet per 1 cwt. 3 qr. 2½ lb.). But the gas produced was of little illuminating power, and the coal gave little or no coke or tar. A second experiment with coal from the same pit, but obtained at a greater depth, gave most satisfactory results. With this coal, which resembles cannel, a gas, with an illuminating power of 25 per cent. superior to that at present used at Milan, was obtained, and producing 52 per cent. of good saleable coke. The quantity of gas produced per quintal of coal was 24 cubic metres. From the geological aspect of the Appennines, and the analysis made of its coal, it may be justly supposed that the deposits of mineral fuel are most extensive and deep. The construction of the proposed railway from Parma to Chiavari, in the valley of the Taro, will contribute greatly to the development of coal mining in the Appennines, and will tend to diminish to a great extent the immense tribute which the Italians pay to foreign countries for fuel only.

MEETINGS FOR THE ENSUING WEEK.

- MON.....Society of Arts, 8. Cantor Lecture. Dr. Letheby, "On Food."
Society of Engineers, 7½. Dr. Cullen, "On the Surveys of Proposed Lines for a Ship Canal between the Atlantic and Pacific Oceans."
R. United Service Inst., 8½. Capt. J. H. Selwyn, R.N., "Further information on the Employment of Mineral Oils as Fuel for Steam Ships."
Farmers' Club, 5½. Mr. C. S. Read, M.P., "On the Sale and Transit of Home and Foreign Stock."
Royal Inst., 2. General Monthly Meeting.
Entomological, 7.
British Architects, 8.
Asiatic, 3.
Victoria Inst., 8.
Social Science Assoc., 8. (Economy and Trade Department.) Mr. Thomas Webster, Q.C., F.R.S., "On the Industrial and Profitable Employment of the Casual and Destitute Poor."
- TUES ...Royal Inst., 3. Professor Tyndall, "On the Discoveries of Faraday."
Civil Engineers, 8. 1. Mr. A. C. Howden, "Floods in the Nerbudda Valley; with Remarks on Monsoon Floods in India generally." 2. Discussion upon "Fresh Water Floods of Rivers."
Pathological, 8.
Anthropological, 8.

Syro-Egyptian, 74. Mr. Bonomi, "On an Alabaster Fragment brought out of the Tomb of Oimeneptah by Belzoni."

WED ...Society of Arts, 8. Dr. Forbes Watson, "On the Extension of the Commercial Relations between the United Kingdom and India, &c."

Geological, 8. 1. Duke of Argyll, "On the Geological Structure of Argyllshire." 2. Mr. C. Babbage, "Notes on the Formation of the Parallel Roads of Glen Roy." Communicated by the President. 3. Mr. D. Mackintosh, "On the Origin of smoothed, rounded, and hollowed surfaces of Limestone and Granite." 4. Mr. D. Mackintosh, "On the Encroachment of the Sea in the Bristol Channel." 5. Mr. D. Mackintosh, "On a Striking Instance of apparent Oblique Lamination in Granite."

Pharmaceutical, 8.

R. Society of Literature, 44.

Obstetrical, 8.

THUR ...Royal, 84.

Antiquaries, 84.

Linnaean, 8. 1. Mr. Murray, "On a new light-giving Coleopterous larva." 2. Mr. Rich, "Specimens of *Amoebota* and *Unio* from the neighbourhood of London." 3. Mr. Barber, "On the Structure and Fertilisation of *Liparis Boukeri*."

Chemical, 8. Dr. W. J. Russell, "On Gas Analysis."

R. Society Club, 6.

Artists and Amateurs, 8.

Royal Inst., 3. Professor Tyndall, "On the Discoveries of Faraday."

FRI.....Geologists' Assoc., 8.

Philological, 8.

Royal Inst., 8. Professor Huxley, "On the Animals which are most intermediate between Birds and Reptiles." Archaeological Inst., 4.

SAT R. Botanic, 33.

Royal Inst., 3. Professor Roscoe, "On the Non-Metallic Elements."

Patents.

From Commissioners of Patents' Journal, January 24.

GRANTS OF PROVISIONAL PROTECTION.

Alimentary substances, obtaining and preserving—105—J. Somervell.
Ammunition boxes, &c.—2630—T. C. Clarkson.
Bags—75—R. Girdwood.
Bale fasteners—52—J. Maury.
Bale fasteners—56—J. B. Dunn.
Blind cords, holding and releasing—92—J. Lewtas.
Boats, lowering—54—J. Granville.
Boats, &c., propelling—4—G. A. D. Goodyar.
Books, sewing—98—J. G. Tongue.
Buildings, warming and ventilating—3682—J. W. Lewis.
Buildings, &c., warming—117—J. M. Kirby.
Cards, playing—66—M. Grant.
Carpets, &c., sizing the backs of—109—J. G. Tongue.
Carriages, landaus, &c.—3600—J. Cockshoot, jun.
Cartridges—12—C. W. May.
Cattle food—95—J. Fawcett.
Clog soles and patten boards—104—J. and W. Hirst.
Coins, &c., receptacles for—77—S. Benjamin.
Copper, &c., calcining—64—P. Spence.
Cord, &c., manufacturing—3520—F. Vita.
Cotton, &c., spinning, &c.—103—J. Pilling and R. Scaife.
Cruet frames, &c.—113—G. Ireland.
Engines—108—N. Hodgson.
Fabrics, &c., folding—107—J. C. Ellison.
Fire-arms, breech-loading—121—W. E. Gedge.
Fire-arms, &c., breech-loading—70—M. Walker and G. H. Money.
Flax, &c., twisting and untwisting—67—J. Tomlinson.
Fuel, artificial—96—J. M. Rowan.
Furnaces—112—T. Whitwell.
Gymnastic apparatus—74—G. W. Bacon.
Hammers, steam—102—A. Budenberg.
Iron tubes—22—J. S. Cockings and F. Potts.
Lamps—91—J. Vivez.
Levels, spirit—123—C. W. Lewis.
Liquids, evaporating—3721—R. Tooth.
Liquids, projecting in the form of spray—45—J. Gardner.
Looms—76—J. Dawson and J. Howorth.
Looms—125—J. C. Ramsden.
Malt liquors, unfermented—86—C. H. Newman.
Mangles—60—G. Warsop.
Metals, removing sulphur, &c., from—48—C. D. Abel.
Mineral and rock drilling apparatus—116—P. Pittar.
Moulds for hollow castings, &c.—99—H. Cochrane.
Needle cases—58—W. Avery.
Nuts and bolts—3381—E. H. Bentall.
Optical illusions—46—F. W. Hartley.

Paper, manufacturing—83—J. Tucker.

Pens, self-supplying—97—G. Davies.

Pens, &c., device for holding—115—M. A. Hamilton.

Presses for expressing wort from spent hops, &c.—72—C. Pontifex.

Railway carriage breaks—3658—P. Demeure.

Railways—3704—A. M. Clark.

Railways—47—E. Myers and G. A. Cannot.

Railways, laying fog signals on—38—G. Platts, W. Tate, and W. H. Bailey.

Roads, &c.—3705—A. Grainger.

Sash fastenings—88—G. A. Heath.

Sewers, purifying—78—W. E. Kenworthy.

Ships' signals, &c.—106—W. W. Hooper.

Shirt fronts, &c.—101—C. S. Lemon.

Silk, &c., for spinning—80—T. Greenwood.

Skates—114—T. S. Ellin.

Skins, tanning—85—C. J. B. King.

Tobacco pipes—111—J. H. Johnson.

Vessels, propelling—79—W. E. Newton.

Waistcoats—69—S. Goldstein.

Walking-stick and lamp combined—40—E. Gourdin.

Washing machines—62—G. Warsop.

Wearing apparel, &c., ornamenting—100—W. Champness.

Wood mouldings, cutters for forming—84—W. R. Lake.

Wool, &c., combing—94—S. Mortimer.

Wool, &c., conveying out of or into washing machines—81—J. Petrie, jun.

Yarn, &c., winding—43—J. Combe.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Book covers—179—H. A. Bonneville.

Boots and shoes—198—W. R. Lake.

Coffins—174—H. H. Lloyd.

Fuel, charcoal—211—T. V. Lee.

Wood rings or washers—197—W. R. Lake.

PATENTS SEALED.

2095. J. Schofield and J. C. Dawson.	2193. P. G. B. Westmacott.
2157. W. Howes and W. Burley.	2324. B. F. Sturtevant.
2170. C. Silvy.	2402. T. Sault.
2173. E. Smith.	2551. D. C. Brown.
2175. E. A. Rippingille.	2913. C. S. Lynch.
2178. E. T. Hughes.	2915. O. C. White.
	3016. R. M. Letchford.

From Commissioners of Patents' Journal, January 23.

PATENTS SEALED.

2063. T. Berney.	2223. R. B. Boyman.
2198. A. Watt.	2239. E. A. Kirby.
2200. J. Jones.	2261. C. de Negri.
2201. W. Gadd and J. Moore.	2263. G. Schneider.
2204. A. Murray.	2275. E. Cornely.
2205. C. Mayo.	2277. A. J. Paterson.
2211. M. J. Fearnley & C. Smith.	2335. A. M. Clark.
2213. G. Gordon.	2439. W. Muir.
2215. J. C. C. Azémar.	3211. T. Wilson.
2216. C. E. Brooman.	3248. I. Swindells.
2218. W. Snell.	3278. R. A. E. Scott.
2219. F. A. Calvert.	3465. J. Adams.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

186. J. H. Wilson.	226. A. A. Croll.
188. J. Snider, jun.	230. C. Falck.
234. W. Clark.	257. W. Foster.
191. C. Brakell, W. Hoehl, and W. Günther.	232. G. Dibley.
209. W., R., J., and A. Woodward, jun.	298. W. Vale.
	243. J. Twibill.
	250. W. E. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

198. J. Vero.	206. C. Lungley.
289. J. Abraham.	

Registered Designs.

4919—Jan. 6th—Hoe adze—Rabone, Brothers, Birmingham.
4920—Jan. 10th—The Livingstone brace buckle—W. Blenkiron and Son, 123, Wood-street, E.C.
4921—Jan. 16th—A hoop skirt—W. S. Thomson and Co., 97, Cheap-side, City, E.C.
4922—Jan. 18th—A trigger guard—J. Hollis and Son, Birmingham.
4923—Jan. 23th—A brooch and scarf pin protector—F. Potts and Co., Birmingham.